TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

JULY 1936

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...to obtain Real "AIR COMFORT" for Operators in YOUR Telephone Exchange--Do as this District Manager has done. *Simply Install*

Gaylord "FRESH'ND-AIRE" CIRCULATING AN PURIFYING UNI

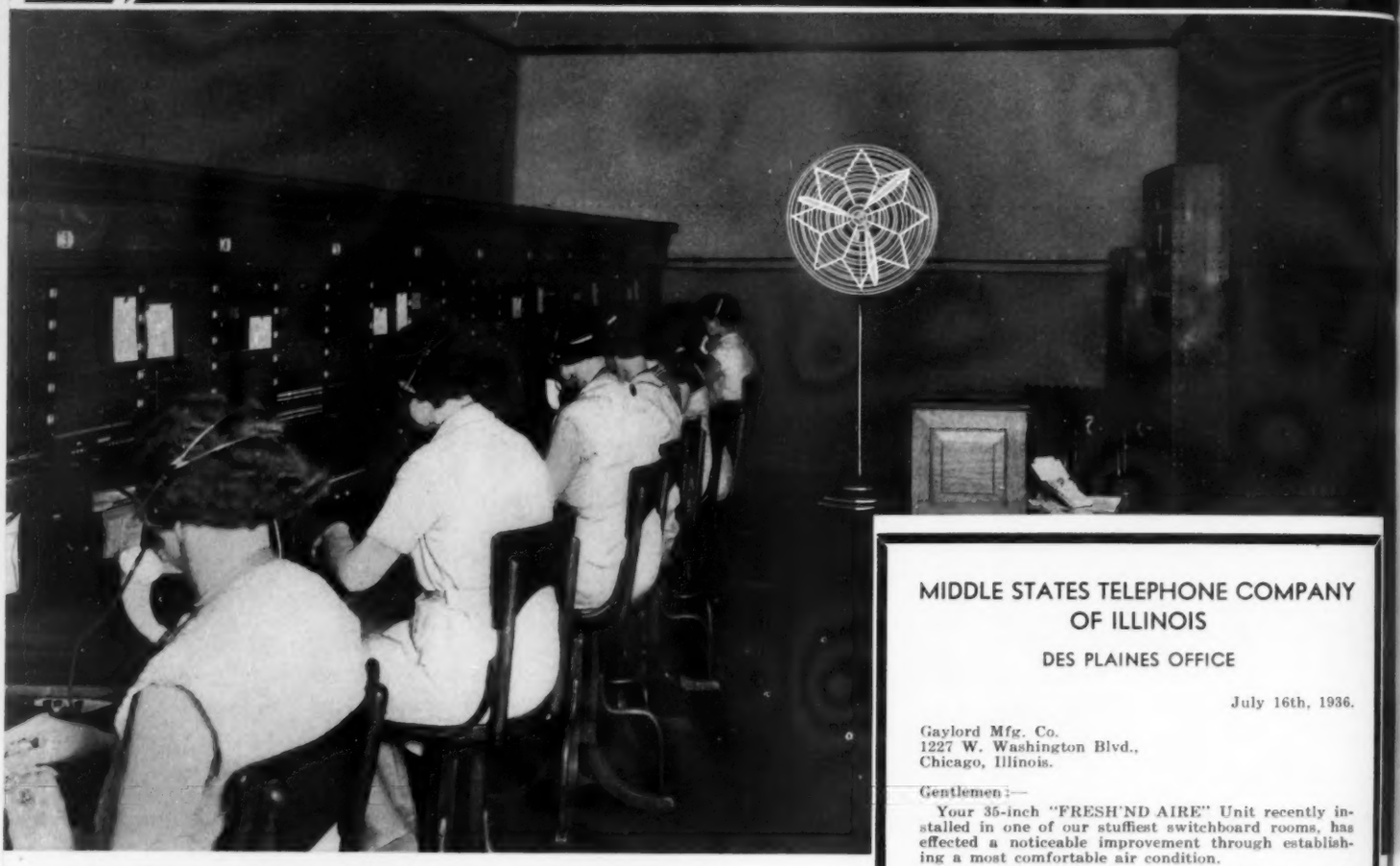

Photo Shows Gaylord "FRESH'ND-AIRE" Unit Installed in Switchboard Room of Middle States Telephone Company—Des Plaines, Illinois, Exchange.

"Air-Comfort"—recognized by everybody as essential to well-being, is now economically brought into the Switchboard and Commercial rooms of telephone exchanges through Gaylord "FRESH'ND-AIRE".

To understand its functions, is to immediately grasp its importance. For, unlike ordinary fans—Gaylord "FRESH'ND-AIRE" circulates all room air *at every level*—QUIETLY—and without draft—and at the same time renders a normally PURE air condition by means of its newly invented Deodorizing Compartments.

You do not get true "air comfort" by simply blowing hot, stuffy air around with a roar and a blast. You must CIRCULATE the air and CLEAN it, too. Only Gaylord "FRESH'ND-AIRE" provides these two necessary elements for obtaining "Air-Comfort" at a first cost within reason—and at operating expense much LESS than obsolete and ordinary fan equipment.

Many Telephone Managers and Supervisors have been hoping for just this answer to the vital problem of "Air-Comfort" for employes and others. Let Gaylord "FRESH'ND-AIRE" solve this problem for you.

MIDDLE STATES TELEPHONE COMPANY
OF ILLINOIS

DES PLAINES OFFICE

July 16th, 1936.

Gaylord Mfg. Co.
1227 W. Washington Blvd.,
Chicago, Illinois.

Gentlemen:—

Your 35-inch "FRESH'ND AIRE" Unit recently installed in one of our stuffiest switchboard rooms, has effected a noticeable improvement through establishing a most comfortable air condition.

Operators there report favorably on the manner in which "FRESH'ND-AIRE" counteracts "dead-heat" beating down through the roof directly overhead. Then, too, it has rep'aced a number of ordinary fans, and at any speed is practically noiseless.

We feel "FRESH'ND-AIRE" with its wide range of draftless air circulation, offers a logical solution to the problem of establishing better operating conditions during hot summer months.

Very truly yours,

GEORGE ECK,

G.E. Vice-President,

T. Midd'e States Telephone Co., of Illinois

Distributed by

American Automatic Electric Sales Co.
Kellogg Switchboard & Supply Co.
Stromberg-Carlson Telephone Mfg. Co.

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TELEPHONE ENGINEER

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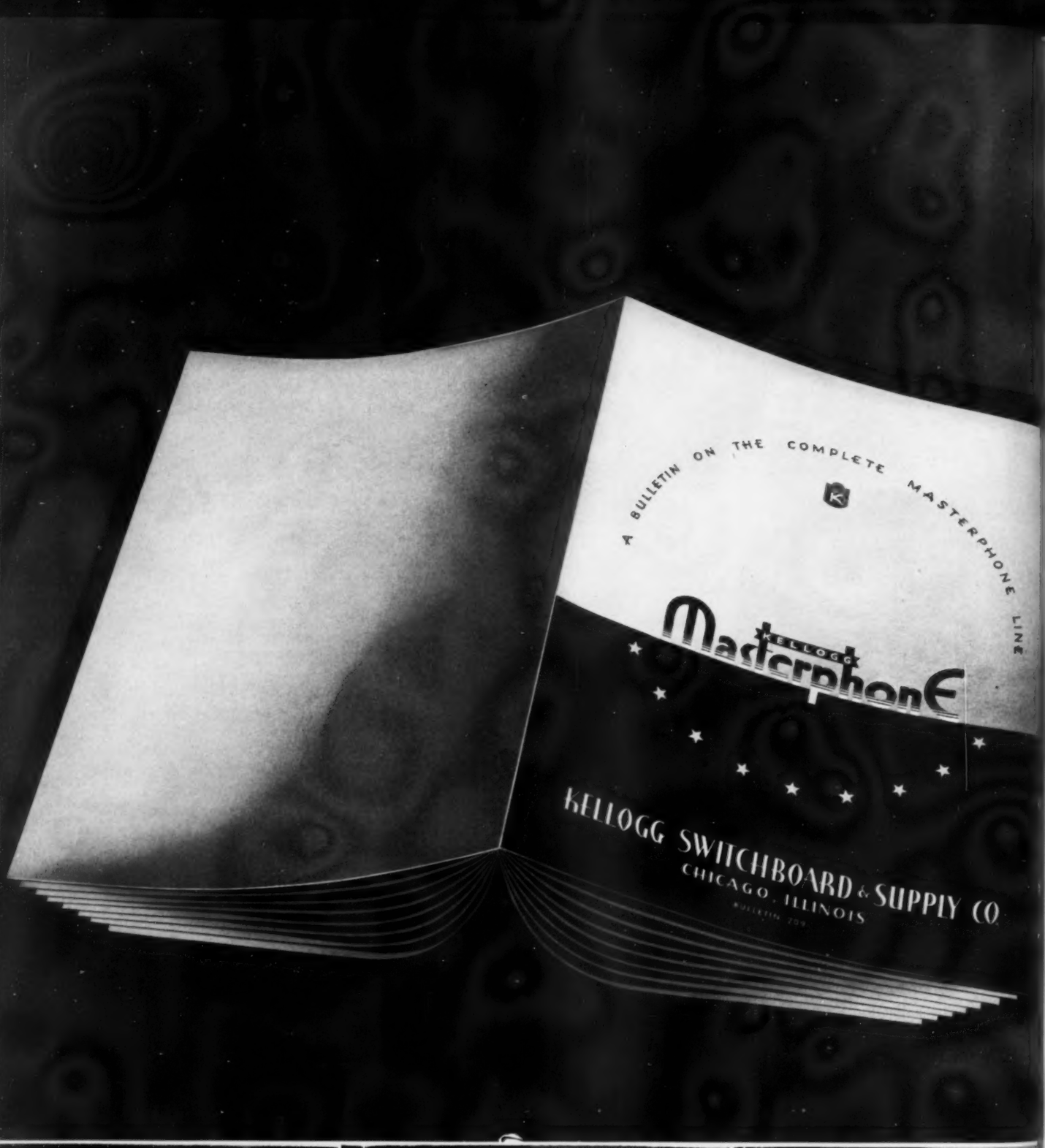
THE POLICY OF THE TELEPHONE INDUSTRY

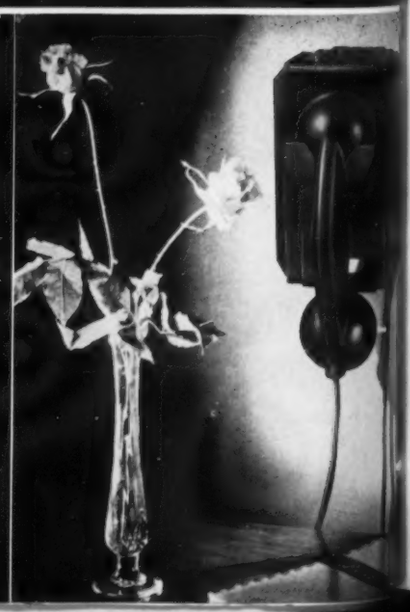
"The most telephone service and the best at the least cost to the public. Telephone service free from imperfections, errors, delays and always at a cost as low as is consistent with financial safety."

• • •

THE TELEPHONE INDUSTRY in 1935—

- **Employed 335,000 persons.**
- **Paid $427,000,000 in salaries and wages.**
- **Paid $104,000,000 in taxes.**
- **Paid $193,000,000 in dividends to 800,000 stockholders.**


A BULLETIN ON THE COMPLETE MASTERPHONE LINE
KELLOGG
Masterphone
KELLOGG SWITCHBOARD & SUPPLY CO.
CHICAGO, ILLINOIS



TELEPHONE ENGINEER
MANAGEMENT · ENGINEERING · MAINTENANCE

JULY, 1936

"Tapping In" On Washington

By ROLAND C. DAVIES
Editor
Telecommunications Reports

● The first court test of the Federal Communications Commission's regulatory power over Independent telephone companies with intrastate operations, but containing Bell System stock interest may loom up as the result of a recommendation, issued July 9 by Chief Examiner Davis G. Arnold, for the Rochester (N. Y.) Telephone Corp. to be held subject to the Communications Act because of alleged "indirect" Bell System control.

The allegations of Bell System control were founded by the FCC chief examiner on three major premises. One was that the New York Telephone Co. of the Bell System operates the toll switchboard used in the Rochester territory, even handling all local toll calls in the Independent company's region. The other was that the Bell System with a 33.5 per cent common stock interest in the Rochester company can exercise control over any merger, sale or lease of property and any financing through new stock issues. The report cited for the latter instance that the Rochester's certificate of incorporation contained the provision necessitating the consent of 80 per cent of the common stock before any action along these lines can be undertaken by the company's directors or management. The third premise was the Bell company's ownership of 48,140 shares of second preferred with voting powers.

● The Rochester company is expected to file strong exceptions to the examiner's recommendations and conclusions in the near future and will seek a re-argument of the case before the FCC telephone division next Fall. If unsuccessful before the division, the Independent company would then ask for a rehearing before the entire Commission and in the event of an adverse decision by that body it is expected that the case may be moved into the federal courts for the first judicial interpretation of Section 2-B-2 of the Communications Act—that law's provision covering the boundaries of federal regulation over telephone companies with purely intrastate operations. The proposal to place the Rochester company under the FCC jurisdiction was viewed by observers as a good illustration of the desire of the Federal Commission to regulate as many of the larger Independents in the country as possible. The Rochester corporation ranks among the five largest Independents of the United States.

We regret that a typographical error appeared in the eighth line of the second paragraph of Mr. Davies' article in the June issue. This paragraph in full should have read:

"When the hearings are resumed in the Fall, it is a possibility that the probing into affairs of the American Telephone and Telegraph Co. and Bell System by the FCC may be fitted into a phase of the political campaign, particularly if the Roosevelt Administration should be centering its fire on "big business' as it has on a number of occasions. Up to the present the investigation has not made any vehicle for the campaign and both the White House and Congress have displayed no public relation to the preceeding by the FCC."

One important legal question on federal control seems to have been settled by a brief reference in the chief examiner's report on the issue that, if a telephone company furnishes leased wires for broadcasting program transmission, such an operation constitutes interstate communication and subjects the carrier to the Communications Act no matter whether every other function is strictly intrastate and without any Bell System control. The examiner's report held that the telephone company *only* has to furnish tariffs on rates for such service to the FCC under Section 202 (b). All telephone companies are required to file tariffs of their interstate rates with the Federal Commission, whether or not they are under its regulation.

● Chief Examiner Arnold took the po-

sition in regard to the New York Telepohne Co. toll board that this arrangement caused the Rochester company to turn over part of the toll traffic revenues for operations which could have been performed by the Independent carrier. The Rochester company defended the toll board setup as a most economical and efficient traffic system. On the common stock 80 per cent consent provisions over mergers and financial arrangements, the examiner's report held that this placed the Rochester company under the joint control over such transactions and policies of the local stock owners with their 66½ per cent of the shares and the New York Telephone Co. with its 33½ per cent of the common shares. The report also cited that with the voting power over certain transactions granted to the second preferred stock holdings of 48,140 shares by the Bell company the latter could outvote the local Rochester stockholders in the company at any time. The examiner indicated a hint that it would effect a $220,700 annual interest saving if the Rochester company retired this second preferred stock. The report also noted that the New York Telephone Co. has a financial interest of $5,100,000 in its various holdings of common and second preferred stock.

The examiner's report did not point to any actual or past exercise of Bell System control over the Rochester company other than the alleged illustration of the Bell company's toll board in the Rochester territory. The report cited incidentally that John P. Boylan, president of the Rochester company, had been vice-president and general manager of the Mountain Home Telephone Co. of Plattsburg, N. Y., which was practically owned by the New York Telephone Co., prior to his coming to the Rochester position.

● The future outcome of the Rochester case is expected to be of far-reaching importance to the Independent telephone industry in showing the trail that will be blazed by the FCC in its efforts to regulate the larger Independents.

• ● •

Independents Gain Decision . . .

However, in mid-June on the question of FCC jurisdiction, Chief Examiner Arnold recommended that three smaller Independent companies in which the Bell System held an approximate 30 per cent stock interest should not be held subject to the Communications Act.

The three companies — the Capital City Telephone Co. of Jefferson City, Mo., the Princeton (Ind.) Telephone Co. and the Intra-State Telephone Co. of Galesburg, Ill. — were listed by the chief examiner after he had held hearings last winter as "Section 2-B-2" carriers with intrastate operations and only physically connected with the Bell System for interstate communication. It is expected that the Commission will adopt his findings. Two other Independents — the Cass County Telephone Co. of Missouri and the Champaign Telephone Co. of Urbana, Ohio, — in which there was a 50 per cent Bell System interest had been adjudged by the same examiner to be subject to the FCC, but the Champaign company has appealed for a reargument before the Telephone Division.

● The Carolina Telephone and Telegraph Co., ranked as one of the largest Independents of the country, also presented its position that it was not subject to the FCC because of a 30 per cent stock interest of the Southern Bell Telephone and Telegraph Co. Injecting this issue into a June 30 hearing on the applications of seven of its officials to hold interlocking positions in the Home Telephone and Telegraph Co. of Virginia, the Carolina company stressed that the Southern Bell stock interest and two Southern Bell officials on its board of directors represented in no way any control, past or present, or any future effort to control by the Bell company. George A. Holderness, the Carolina company president, and John R. Porter, executive vice-president, related the history of the company and told of their relations with Southern Bell in toll connections, engineering assistance and other telephone activities.

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Takes a Vacation . . .

● The summer months of July and August will mean a period of vacation doldrums at the Federal Communications Commission for the first time since its creation in mid-July, 1934, so that telephone executives need not retain a weather eye on its activities. The Commission has decided to suspend hearings and decisions, except on emergency and routine matters for the torrid weather.

When activities again start up in the Fall, the presidential campaign, of course, will be in full swing so that the FCC may be inclined to steer clear of controversial matters — unless political needs should inject its activities into the election fray. The future of the American Telephone and Telegraph Co. investigation will depend on the outcome of the election. But, whatever the outcome, it is deemed rather certain that no further funds than the second $400,000 appropriation of the last Congress, which will carry the inquiry to next February 1, will be available for the Commission. With the re-election of President Roosevelt there is bound to be a strong economy move in the next Congress. Also the FCC received a rather stern warning that it could not seek further funds for the investigation and Congress alone would decide whether more money should be utilized for this enterprise.

● The telephone investigation hearings will begin again in the Fall, according to present plans of the FCC. During the summer months the investigation staff will concentrate on its delving into various phases of the A. T. & T. and Bell System. The Commission will endeavor to press its activties on the inquiry to completion of a number of subjects so it can present a report for the opening of Congress. Recently, there has been a growing viewpoint among Commission authorities that the major goal of investigation should delve into subjects primarily linked with the rate structure. It is believed likely that the hearings next Fall will feature testimony on engineering studies which have been made by the investigation engineering staff under the direction of Cyrus G. Hill, who was formerly with the telephone engineering firm of J. G. Wray & Co. Probably there may be a change of procedure to concentrate on fundamental telephone regulatory matters such as depreciation, manufacturing costs and telephone operating practices rather than an attack along a wide front of Bell System activities as had been the modus operandi of the hearings during the past spring.

The original $750,000 appropriation of the investigation was exhausted in mid-June and now the investigation is being conducted on the new $400,000 fund. As this latter allotment is not sufficient for the present inquiry staff to continue until next February 1, it has been indicated that a reduction of approximately 30 per cent in the size of organization will be necessary during the summer months.

• ● •

Another Acquisition . . .

Another telephone acquisition case has come before the FCC — the purchase by the Southwestern Associated Telephone Co. of Texas of the Texas exchanges and several Kansas and Oklahoma exchanges of the Western Light and Telephone Co. During the Summer the FCC is expected to investigate the $275,000 purchase price and may possibly send accountants and engineers to Texas to survey the exchanges to be purchased because the

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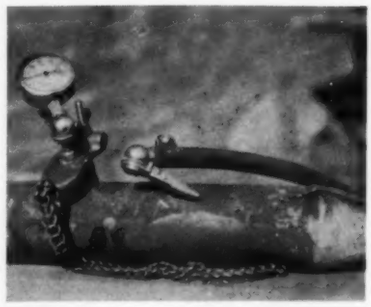
MODERN Practices in Cable SPLICING

By RAY BLAIN

Screwing fixture into hole in splice

Placing gas valve and clamp on fixture in splice



Small gauge on valve and hose from gas tank

Gas tank connected to cable under test

Gas tank mounted on cable splicing trailer

The combination of good wiping solder, the Dillon Temperometer and a good gas testing outfit are the prime requisites for successful cable splicing

● Recently, I have been able to realize one of my numerous dreams and despite the contention of many to the contrary I now know that dreams do come true. At least a firm foundation has been built under one of my numerous air-castles. But to come down to earth and tell you what I am talking about. For years I have been of the opinion that some means could be provided whereby an inexperienced man could successfully splice telephone cable.

I have had numerous ideas concerning a moulded cable joint, but I have never had much success with that and then along came Dillon with his Temperometer and immediately over half my difficulties were solved and I decided to concentrate on the old style wiped joint. Next I rightly figured that we needed a nitrogen gas cable testing outfit. The finding of a suitable gas testing outfit presented a real problem. After we finally obtained the necessary funds with which to purchase one, strange as it may seem, none of the technical trade journals we had on file at that time carried any advertising on this important equipment. We finally purchased one through a distributor of telephone supplies and now, after more than a year has elapsed it has proved to be one of the best investments we have ever made.

We purchased two of the 51″ x 8½″ cylinders which store nitrogen gas at a pressure of 200 pounds per square inch at 70 degrees F. These cylinders were mounted on top of our cable splicing trailer with special clamps in order to give a convenient means of having an adequate supply of gas always available. The tank is equipped with a regulator or reducing valve and gauge which register the high pressure in the cylinder and the lower pressure in the outlet hose. A special fitting which clamps on the cable being tested practically completes this simple testing outfit. The gauges, valves and other fittings are stored in a suitable case when not in use.

● The usual method of gas testing the entire length of the cable in sections by providing dams of paraffin or other suitable wax at regular intervals is not, we have found, an absolute necessity in order to gas test a splice. After each splice is completed, gas may be applied to it and sufficient pressure built up inside to blow bubbles when soapy lather is applied on the outside if the smallest pin hole exists. We found this to be true even when splicing two pieces of cable together whose combined length was not over 300 feet with both ends open. It seems that when as little as 100 feet or less of the present day, tight wrapped cable is connected in one end of the splice with the other end of the cable open, the gas escape is so slow that there is no difficulty in maintaining a sufficient pressure in the splice for a period of time sufficiently long to make the soap test. Some gas must necessarily be lost with this method but as nitrogen is comparatively inexpensive this is really of no consequence.

We all know that the splicing of the conductors in a telephone cable does not present any great difficulty for the average telephone man, but the wiping of the lead usually means trouble. In our noble experiment we selected a man with average experience in general telephone work but one who had no previous cable experience other than being a helper on several occasions, therefore, having only a general idea of how a splice should be made. His initial attempt was a straight splice on a 50-pair cable. The paraffin and the wiping solder were both heated carefully to correct temperatures as indicated by the Dillon Deluxe Temperometer. The completed splice didn't look so good, we had to admit, but we decided to give it a gas test regardless of its appearance. We first

Dillon Deluxe Temperometer
in paraffin pot

drilled a small hole in the top and screwed-down the special fitting provided for the gas connection. We next clamped the valve on the fitting and sleeve using the chain and wing-nut arrangement. Next we attached the hose from the reducing valve on the tank and released gas into the cable until the low pressure gauge registered 30 pounds. We maintained this pressure for about 30 seconds and then removed the hose connection from the valve on the cable sleeve and clamped the small gauge in place. The pressure first registered about 12 pounds on this gauge but quickly dropped to zero. We then replaced the gas connection and built-up the pressure again, then quickly applied a thick soapy lather over both ends of the sleeve. We soon found out where our gas was going for as a bubble blower that sleeve broke all known records. We were somewhat discouraged but decided that something was radically wrong and started an investigation to discover the source of our trouble.

● The investigation soon produced results and we found that our trouble was apparently due either to one or all of three things: (1) whipping of the solder with the ladle; (2) the overheating of it at some previous time, or, (3) inferiority of the solder. We bought some new wiping solder from a well known manufacturer and when the defective splice was rewiped, we found to our extreme pleasure that the gas held, and not a single bubble was formed no matter how much we soaped it. After that we found very few failures when the splices were wiped the first time, if they did leak we reheated the metal to the correct temperature and rewiped the splices. We never have had a failure after the second wiping. The gas test proves conclusively that successful cable splicing depends to a great extent upon the proper heating and quality of wiping solder.

Not only did the gas testing prove to us that solder must be heated to the correct temperature for successful cable splicing but also that it can be instantly ruined by one overheating. If a percentage of tin is burned from the metal by this overheating it is quickly indicated by gas leaks from the splice blowing bubbles.

We have found that the new Dillon Deluxe Temperometer is used with a greater degree of accuracy by the average telephone man, due no doubt, to the fact that the proper temperatures for solder, waxes and paraffin are indicated plainly on the large, easy reading dial of this wonderful little instrument.

● After trying various kinds of soap suds for splice testing we decided that a thick lather made from a good grade of soap flakes is the most satisfactory. After a splice is made and the gas hose is connected we soap both ends of the sleeve well before applying the gas pressure and then after a suitable pressure is built-up we quickly find out whether it is going to be a sound splice or just another bubble blower. After a splice had been completed and tested O. K. the gas fixtures are removed and the hole sealed with solder. If the special drive-plug is used, which is quite inexpensive, the hole may be soldered immediately and if not it will be necessary to wait a few minutes until the gas pressure is reduced to a point which eliminates the danger of the gas blowing bubbles through the hot solder with which the hole is being sealed. With the method of individual splice gas testing described above it is not necessary to wait more than five minutes in any case before the pressure is reduced sufficiently for safe soldering.

Our inexperienced man carried on and completed the job on 20 splices and now after several months have elapsed and in spite of the unusually heavy spring rains, the insulation resistance on this cable system is still tops. We have no reason to doubt that this system will be just as lasting as had it been spliced by a man with years of experience in cable splicing. The splices may not present the good, smooth appearance as those made by an experienced splicer but in our opinion that is of small consequence so long as they exclude moisture.

Most telephone men seem to be under the false impression that gas testing of cable is very complicated and can be successfully performed only by an expert. They seem to liken it to black magic, witchcraft, or something even more horrible, to be shunned at all costs. This false impression may be due to the fact that accurate detail information on gas testing of cable has been most difficult to obtain. Even after we purchased our gas testing outfit we had to figure out a means of using it. No one need have even the slightest fear of this modern method of cable testing for it is just as simple as pumping up an automobile tire using the free air and automatic pressure gauge at a super filling station.

● We now firmly believe that our successful use of the combination of good wiping solder, the Dillon Temperometer and a good gas testing outfit proves conclusively that one does not necessarily have to delay cable splicing operations if there is no experienced cable splicer available, but this work can be done by the average experienced telephone man. Also we are of the opinion that one should never eliminate the gas testing of any cable regardless of the splicers' ability for even the best of them have an occasional failure and it is a great satisfaction to know positively that the newly completed splice will not get wet in the first heavy rain.

One manufacturer at least is now making a gas tight cable terminal and we predict that in the near future all exchange cable systems will be maintained under constant gas pressure as are our principal present day toll cables. Each cable will have a pressure meter on it in the central office and probably at certain other points throughout the exchange. The lowering of gas pressure would then sound an

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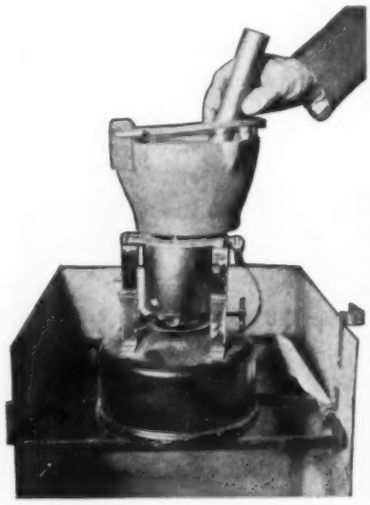

Dillon Junior Temperometer
in solder pot

By C. K. BROWN

Switchboard Maintenance

Mr. Brown starts a series of articles featuring P. B. X. switchboard maintenance, the data and information in which are applicable to all types of switchboards and associated equipment.

● Since a number of more or less delicate mechanical parts electrically and magnetically operated are assembled in the P. B. X. switchboard, it is the consensus of opinion of many who have the responsibility of maintaining this class of telephone equipment, either directly or indirectly, that care, skill, and judgment are required in handling repairs. Also that the first step toward becoming an expert in maintaining P. B. X.'s is a thorough knowledge of the particular system installed, and the authorized maintenance practices.

While it is not absolutely necessary, in order to become an expert in maintaining P. B. X. equipment, that one be well advanced in physics or mechanics, yet if one can be proficient in these sciences, it will be a great help in aiding him to accomplish his work with greater speed and more exactness, than if he has no knowledge of them. For this reason, a review of physical quantities will be made.

The primary physical (pertaining to nature, or to material things perceptible to the senses) quantities are force, work, and energy which involve in their study other quantities namely, time, length, area, volume, mass density, speed, acceleration, and power.

● In studying or dealing with any one of these physical quantities, it's exact nature should first be known, which may be expressed as a definition, and second, there should be a method of measuring it.

The quantities named above, can be divided into two main groups. (1) those which are fundamental, that is, do not depend on any other physical quantities for their definition or measurement; and (2) those which have a definite relation to other quantities and can be defined in terms of them.

There are three quantities in mechanical measurements which are fundamental, that is, do not depend upon anything else, namely, the unit of length, unit of time and unit of mass.

Distances are measured by comparing them, with established standards for the measurement of length, such as the foot, yard, mile, etc. Time is likewise measured with the unit seconds, minutes, hours, days, etc. The unit mass however, is not usually so well understood, and is easily confused with another of the physical quantities called force. Mass is defined as the amount of matter or material in a body. The unit used as a basis for its measurement is a certain block of platinum which is kept at the bureau of standards office in London, England, and called the Avoirdupois pound.

The possible confusion which is likely to exist in thinking of the unit of mass, arises from the fact, that there is not a direct way of comparing the mass of two similar objects to the way in which two distances can be compared by measuring with the same yardstick. In the case of two masses they must be measured indirectly, for example, by the amount of pull exerted upon each by the earth which tends to cause it to fall to the earth's surface.

● This process of measuring the pull exerted by the earth, is known by the term "weighing". If then, two bodies weigh the same, that is, are pulled toward the earth with the same force, it is said they contain the same number of units of mass. This is true since the amount of the pull depends upon the amount of mass in the body. However, the number of units of weight as indicated by the scales should not be confused with the number of units of mass in the body. This theoretical distinction between the mass and weight of bodies probably will not enter into the discussions to follow, but it is well to have in mind that the distinction does exist.

Area, volume and density, are quantities which are obtained directly from the fundamental ones. The process of multipying a length by a length to obtain an area and of multiplying an area by a length to obtain a volume is undoubtedly familiar.

Density as the name implies, measures how closely matter or material is packed together and is defined as the mass (amount of matter) contained in each unit of volume. This relation between substances can also be expressed in terms of the ratio (proportion) of the weight of a given quantity of each substance to the weight of the same quantity of water. The term, specific gravity is to describe this property of substance. For example, if the specific gravity of the electrolyte (mixture of sulphuric acid and pure distilled water) in a P. B. X. lead plate storage battery is 1200 it is known that a cubic foot of it weighs 1.200 times the weight of a cubic foot of water. Since the weight of a cubic foot of water equals 62.5 pounds a cubic foot of the battery electrolyte would be 62.5 times 1,200 or 75 pounds.

● Speed is also defined in terms of two fundamental units, distance and time.

It may be expressed as the rate of covering distances, that is, the amount of distance passed over per unit of time. The point to grasp is that in stating the speed of any object, information is not given about how far the body will travel or has been traveling. It is merely that in each interval of time it will cover so much distance if it continues to move at the stated rate of speed for the entire interval.

It is a known fact, that all stationary objects try their best to remain where they happen to be, and that if an attempt is made to move them it takes some muscular effort. This effort is commonly known as force.

A force can be defined as that which tends to change the speed of a body, or to accelerate it positively or negatively. A body may have several forces acting on it at the same time which may balance each other in their efforts so that the net result is zero change in speed. For example, in a tug of war, 12 men on one end of a rope might be pulling with the same force as 12 men on the other end with the result that there would be no "change in speed" or motion of the rope. However, if the rope should be suddenly cut in the middle, the tendency of the forces being exerted to produce motion would at once be apparent to all spectators.

● Force is usually measured in terms of the acceleration it will produce, and the unit of force is the force (called force of gravity) with which the earth attracts the standard mass of a pound. This unit is named the "pound" of force.

If a force is successful in producing motion in a body, there exists the condition of a force acting through a certain distance along the line that the body moved. This idea is expressed in physics by saying that work has been performed. The definition of the quantity work, as used in physical science, is therefore, the action of a force through a distance. It is understood that the force acts in the direction of the motion being produced. The unit of work is the foot pound or a force of one pound acting through a distance of one foot.

Power is defined as the rate of doing work in the same sense that speed is the rate of covering distance and acceleration is the rate of changing speed. The unit of power ordinarily used, is the horse power (H.P.) which is a measure of doing work at the rate of 550 foot pounds per second or 33,000 foot pounds per minute.

● Energy is a general term to express the idea of the ability to do work. The water of a river held back by a dam, the coiled spring of a switchboard dial, the lead peroxide and spongy lead plates in the electrolyte of a P. B. X. storage battery, all possess energy for they have the ability to do work if allowed to do so. These three examples of energy are only a few of the several forms in which energy may exist. Others are the form of heat, a magnetic field, the motion of a body, etc.

Since energy is a measure of the ability to do work, it can be measured in the same units used for the measurement of work, namely, foot-pound. There is one very important principle with regard to energy which should be appreciated and that is the principle of the "Conversion of Energy." By this is meant, the fact that energy cannot be created or destroyed. All that can be done with it is to convert it from one form to another and after all of these changes, the grand total of the energy available remains unchanged.

Science informs us that there are only two kinds of electricity. One is negative electricity, being, in fact, the tiny particles called electrons, familiar as one of the numerous particles which operate radio vacuum tubes. The other kind of electricity is positive electricity; its ultimate particles are called protons.

Although it is not known exactly what electricity is, a great deal about what it will do under various conditions is very well known. Briefly, in P. B. X. practices the chief interests in electricity are: (1) Ways in which it may be produced; (2) Means of transmitting it; and (3) Manner in which it can be converted into mechanical form to produce active forces.

While electricity is about the most indefinable word used in electrical science, one has as a starting point to assume that electricity is of such nature as to be capable of possessing quantity and is represented by the amount of electricity present in any current or change. Two things are necessary to produce electric current; first, something which will keep the current in motion, called by various names, electromotive force (E. M. F.), difference of potential, voltage, pressure, etc.; and second, something to guide the current flow. This latter is called a conductor.

Electromotive forces for use in P. B. X. operating practices can be produced in several ways, one of which is by metallic plates of different materials when placed in suitable solutions. This method is applied in the construction of all primary cells, as well as in the secondary or storage cells.

● The same voltage is always obtained with each particular combination of two plates and a solution. This is true of the size of the plates, their distance apart, or the amount of solution which surrounds them. They all have a definite relation to other operating characteristics of each combination, but do not affect the voltage.

An E. M. F. can also be produced by (1) Action of a conductor cutting across the lines of force of a magnetic field at right angles. This is the method used in dynamos; (2) Action of an increase or decrease in the number of magnetic lines of force which surround a conductor. The induction coil used in telephone work and transformers utilize this principle in their operation.

Every E. M. F. has two essential properties: First, magnitude, expressed in terms of volts; and second, direction. An E. M. F. which always tends to produce an electric current in the same direction is called a direct current E. M. F. or D. C. voltage. It is possible to produce an E. M. F. which always tends to produce an electric current in one direction, and then the reverse direction, and to keep this reversal up at any desired rate of speed. Such an E. M. F. is called alternating, or commonly, A. C. voltage.

● One more quantity (that property of anything that may be increased or diminished) remains to be considered before the study of circuits can be taken up, namely, electrical resistance which may be defined as the opposition offered to the flow of an electric current through a conductor. This quantity, known as resistance, acts in a similar manner to the way in which friction hinders the movement of an automobile, and all other mechanical devices. Or just as the flow of water in a pipe is opposed by the friction inside of the pipe.

All substances offer resistance and can be classified into two main classes. Those materials whose resistance is small are called conductors, and those whose resistance is large are called insulators.

In as much as electrical resistance depends upon the following factors: (1) The length of the conductor; (2) Its cross section; (3) Kind of material used; and (4) The temperature, the laws governing electrical resistance may be stated as follows:

(1) The resistance of the conductor is directly proportional to its length, the temperature and cross section of the conductor remaining constant. That is, the resistance increases at the same rate the length of the conductor increases, just as the resistance of a pipe to the flow of water increases as the length of the pipe is increased, all other conditions remaining the same. Hence, if the length of a conductor is increased to six times its original value, the resistance will be six times as much, or if the length is divided into six equal parts, the resist-

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Telephone Transmission
Theory and Practice

By ROBERT A. CLARK, JR.

CHAPTER VI

Methods and apparatus for measuring telephone transmission are discussed in this chapter. A simple and reliable transmission measuring set is described

● In Chapter V we discussed the theory of telephone transmission and the history of the transmission measuring unit. You will recall that the standard transmission unit, the decibel, indicates the ratio of power received (for example, at the end of a line) to the power transmitted. This is without reference to the actual amount of power, (in watts or milliwatts) which is being transmitted or received.

As we are concerned not only with the ratio of power but also with its actual value, we arbitrarily define a given value of power and call it **zero level** expressed in decibels. An analogy to this is the temperature scale of a thermometer. Temperatures are expressed in degrees above and below the zero reference. Likewise in telephone transmission, we express the power passing a given point in decibels above or below the zero reference level.

When the idea was originally conceived of expressing power by means of a decibel level it became necessary obviously, to choose a value of power which would be the reference or zero level. At that time a value of 6 milliwatts was chosen, based on the fact that the power output of a telephone set was approximately this amount when the transmitter was spoken into. A power output of 6 milliwatts is equivalent to a voltage of 1.90 volts across a 600-ohm resistance.

● When the first level meter, using a rectifier type voltmeter was brought out, the reference level used was 6 milliwatts delivered to a 500-ohm line. This is equivalent to a voltage of 1.73 volts across a 500-ohm resistance. It is unfortunate that a 500-ohm line was chosen instead of a 600-ohm line because practically all telephone equipment is designed to match 600-ohm impedance circuits.

A few years ago a second reference level was introduced which is 1 milliwatt. This is equivalent to 0.775 volts across a 600-ohm line.

As practically all transmission comparisons are made by means of a voltmeter measuring the voltage across a resistance, considerable confusion has arisen because of the reference level system which now exists. The confusion resulting from the different reference levels would not be so serious were it not for the fact that the most practical method of making transmission measurements is by the use of a voltmeter reading the voltage across a 600-ohm resistance. This method is as follows:

Assume we have a telephone line consisting of 100 miles of No. 9 AWG copper open wire. At each end we have a vacuum-tube oscillator and an associated amplifier having an output impedance of 600 ohms. We also have a voltmeter and a 600-ohm resistor. To measure the transmission loss in the east-west direction, the oscillator at the east end is connected first to the 600-ohm resistor which is bridged with the voltmeter, and the output adjusted until the meter reads, say 1.0 volts. The oscillator is then disconnected from the resistance and connected to the telephone line. At the west end of the line, the 600-ohm resistor and voltmeter are connected to the line. The reading will be found to be approximately 0.51 volts. From Table 7 (Chapter V) we find that this voltage ratio is 5 8 db. If the transmission is to be measured in the opposite direction the same procedure is followed using the oscillator at the west end of the line.

● On loop measurements where both ends of the circuit terminate at the same point, only one oscillator and meter are required, the principle being the same as on straight-a-way measurements. The 600-ohm resistance and voltmeter are first connected directly to the oscillator and the output adjusted to a given value, say 1 volt. Then the unknown loss is connected between the oscillator and the meter and the voltage noted. From the voltage ratios shown in Table 7, the transmission loss may be computed; for example, if the meter reading when connected directly to the oscillator is 1 volt and drops to 0.891 volts when the unknown loss is inserted between the oscillator and meter, the transmission loss is 1.0 db.

This procedure is undoubtedly the simplest for measuring transmission losses on lines and equipment or gains through repeaters.

The level meter first brought out several years ago was calibrated directly in decibels using the reference level of 1.73 volts (6 mw to 500-ohm line). Subsequently numerous other manufacturers have brought out level meters, all of them using this same reference level. These meters will all read the true power reference level of zero on a 5 milliwatt basis when connected across a 600-ohm resistance (the correct value for practically all telephone measurements). The meter will read 0.8 db low, if 6 milliwatts is used as a base.

● Inasmuch as there are thousands of level meters now in the field, all of which are calibrated on a 1.73 volt level base and furthermore as there is only 0 8 db difference between this reference and the 6 milliwatt base, I

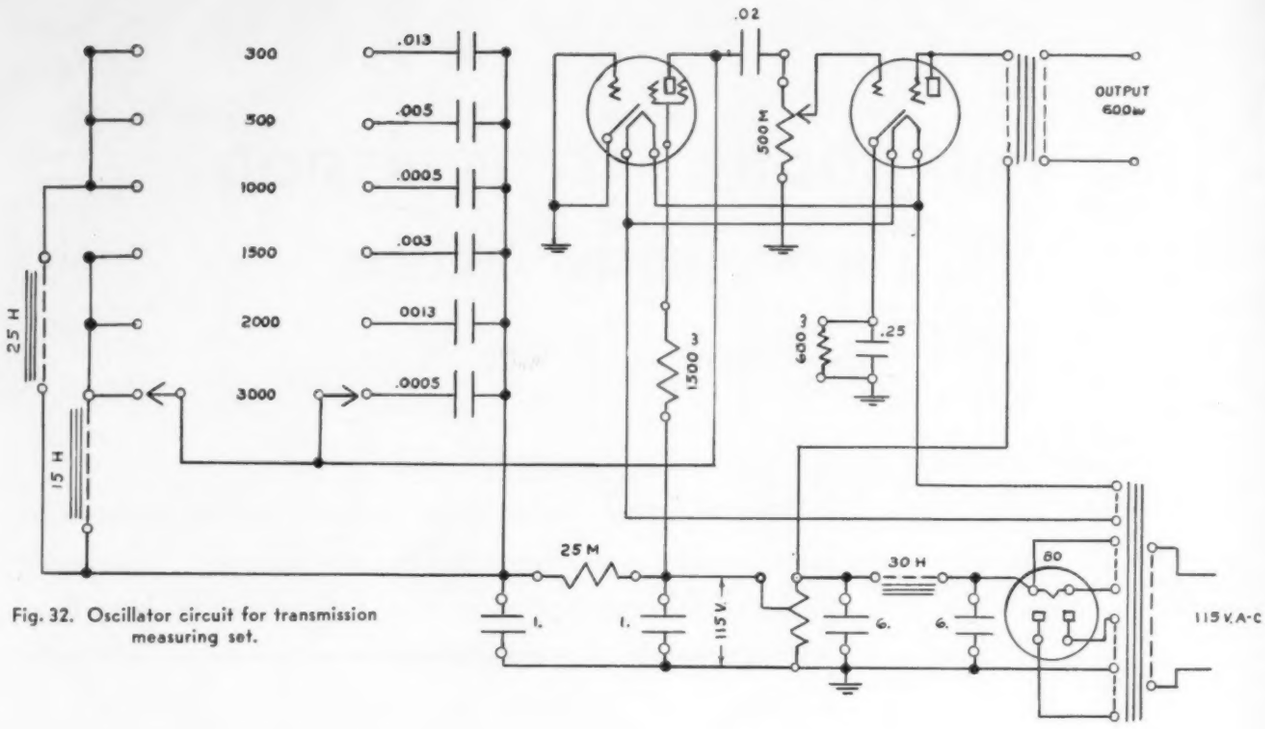


Fig. 32. Oscillator circuit for transmission measuring set.

see no reason why we should not adopt the 1.73 volt level as standard; this has a significant meaning, as it represents the approximate power output of the average telephone subset. Therefore, in subsequent discussions we will assume that the reference level, unless otherwise stated, is 1.73 volts across a 600-ohm line which is equivalent to 5.0 milliwatts. The difference between this level and the one milliwatt reference level is the power ratio of 5 to 1 or 7 db. If for example, a transmission measuring set at one end of the line is calibrated on the basis of 1 milliwatt reference level and the one at the other end of the line, on the 5 milliwatt basis, which we will use, 7 db should be added to the loss measured by the instrument calibrated on the 1 milliwatt basis and 7 db should be subtracted from the reading of the instrument calibrated on the 5 milliwatt basis.

If you wish to use a voltmeter as a level indicator, Table 8 may be used to convert voltages to decibels. This table is based on a reference level of 1.73 volts to 600 ohms or 5 milliwatts.

There has been considerable misunderstanding in the past as to the proper use of the level meters in measuring telephone transmission. The general procedure has been to use two level meters. One associated with the oscillator and the other at the receiving end of the circuit. The level which the oscillator sends to the line is noted and the level at the distant end is noted. The difference is then assumed to be the transmission equivalent of the circuit. Serious error may result in this method; in the first place, the impedance of the line to which the oscillator is connected, may vary widely depending on the type of facilities, such as open wire, loaded or non-loaded cable. This may range from as much as 150 ohms in the case of non-loaded cable to 1500 ohms in the case of iron open-wire. It is possible to apply a correction factor to the level reading if the impedance of the circuit is known; however, in general, such impedances are not known with sufficient accuracy for satisfactory transmission measurements. At the receiving end, the line must be terminated with a resistance having the proper value for use with the level meter. If 6 milliwatt is used as the reference level and the meter is calibrated for use on a 500-ohm line, a 500-ohm resistance must be shunted across the level meter. If the shunt is not used, the receiving level may be in error as much as 6 decibels. The preferred method, and the only one which gives a true measure of transmission loss is the one described in the early part of this chapter. The level meters are entirely suitable for this method if they are shunted with a resistor of such value that the combined resistance of the meter and resistor is 600 ohms. The other requirement is that the oscillator output impedance be 600 ohms.

TABLE 8. RELATION OF VOLTAGE TO DECIBEL LEVEL

V	Db.	V	Db.
17.3	+20	1.54	– 1
15.4	+19	1.38	– 2
13.8	+18	1.23	– 3
12.3	+17	1.09	– 4
10.9	+16	.975	– 5
9.75	+15	.868	– 6
8.68	+14	.774	– 7
7.74	+13	.690	– 8
6.90	+12	.614	– 9
6.14	+11	.548	–10
5.48	+10	.488	–11
4.88	+ 9	.435	–12
4.35	+ 8	.387	–13
3.87	+ 7	.346	–14
3.46	+ 6	.308	–15
3.08	+ 5	.274	–16
2.74	+ 4	.244	–17
2.44	+ 3	.218	–18
2.18	+ 2	.195	–19
1.95	+ 1	.173	–20
1.73	0		

● In this connection I might add that you may occasionally observe apparent errors in transmission measurements when using the method described, if the output impedance of the oscillator has an appreciable reactive component. This occurs generally in the case of equipment which also has reactance in addition to resistance. For example, if you were to measure a W. E. Type 70-A repeating coil at around 3,000 cycles you might find that the loss measured practically zero. This is due to the fact that the coil has a large distributed capacity, which partially resonates with the inductance of the output transformer in the transmission oscillator. The resultant

indicated loss is somewhat less than the true loss which would be observed if the coil was connected between an oscillator having an output impedance of 600 ohms pure resistance, and the meter. It is rather difficult to design a transmission oscillator with zero reactance in the output transformer and the error mentioned above may therefore occur in some cases. However, it is generally small, being less than one or two db and, in most cases may be disregarded. In the cases, where it is necessary that accurate measurements be made, the output impedance of the transmission oscillator may be adjusted to a pure resistance value by means of a series condenser of sufficient magnitude to neutralize the reactance of the output transformer. Obviously a given sized condenser will neutralize the transformer reactance at only one frequency. We will discuss this matter of reactance and its effect on transmission in a subsequent chapter.

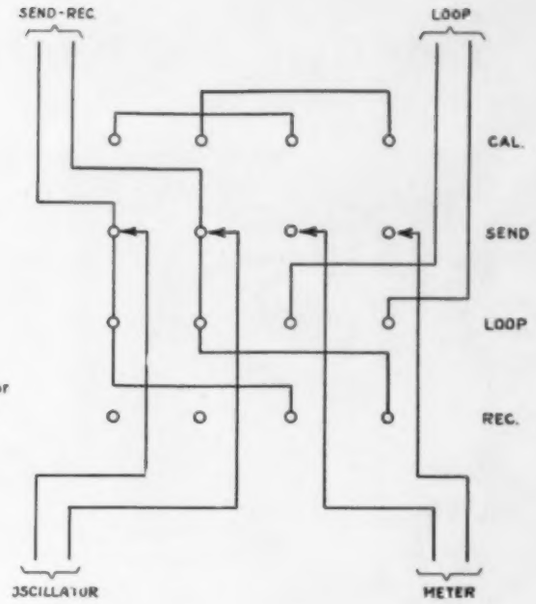


Fig. 34. Switching circuit for transmission measuring set.

Transmission measuring equipment is essential for the proper maintenance of long distance telephone circuits. The equipment which is described below, appears to be as simple and practicable as any which has ever been developed. Fig. 32 shows the wiring diagram of the transmission oscillator together with a one-stage amplifier. The oscillator is known as the dynatron type and is used because of its simplicity. The output of this unit is approximately 10 volts into 600 ohms, which is equivalent to a level of approximately +15db. The oscillator tube used is a type 36. This employs a 6.3-volt filament. If a 2.5-volt filament tube is to be used, the type 24 tube is suitable. Output tubes which are suitable are types 45 or 56 if a 2.5-volt filament is used, or type 42 or 76 if a 6.3-volt filament voltage is used. The 56 and 76 tubes will not permit quite as high an output voltage without distortion as will the 45 or 42 type tubes. The type 42 tube is preferred to the 45, as it is a heater type cathode and has less inherent hum. When the type 42 tube is used, the screen and plate should be tied together so that it operates as a triode. If it is desired, to use the oscillator on direct current a type 43 tube may be used together with a 36 and the filaments connected in series together with the proper resistance for operation directly from the 115v. d-c supply. The wave-shape of the oscillator is quite satisfactory and is entirely suitable for transmission measurements. The range of the oscillator covers the voice band from 200 to 3,000 cycles in steps as follows, 300, 500, 1,000, 1,500, 2,000 and 3,000 cycles. The value of inductance and capacity shown in the diagrams are approximate. The condenser settings may be changed, to provide frequencies other than the above if desired. However, the steps shown are most practical for ordinary measurements. The diagram shows connections for 115-volt a-c power supply. However, the set will work very satisfactory on 115 volt d-c supply by using the tubes described above.

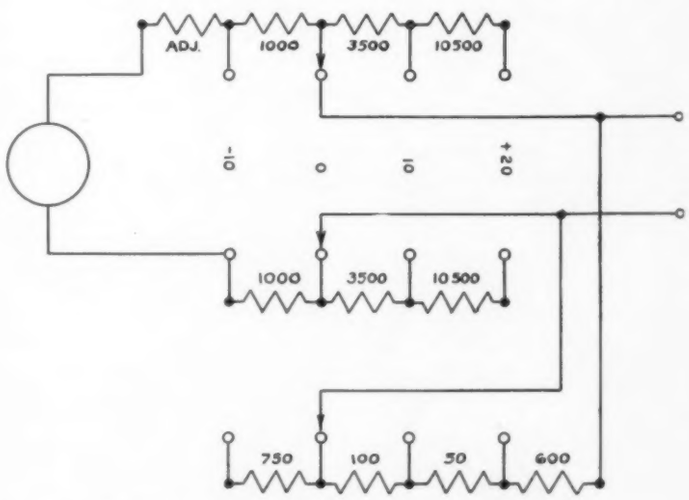


Fig. 33. Meter circuit for transmission measuring set.

● The meter circuit is shown in Fig. 33. This consists of a rectifier type voltmeter having a full scale deflection of 0.614 volts and a resistance, at full scale deflection of 1,000 ohms. The meter is calibrated to read +1 db at full scale deflections, ranging downward, to −16 db. The resistances shown in Fig. 33, used to change the range of the meter, provide an accuracy within 1 db except on the −10 scale. Here the accuracy decreases at the low scale rating and is an error by about 2 db. This is due to the characteristics of the rectifier type meter wherein the resistance characteristic increases appreciably at low scale values. The switch for the meter consists of a 3 pole 4 position rotary switch. The markings indicate the decibel level to be added algebraicly to the meter reading. For example, if the switch is on the +10 lb position and the meter reads −5 the level is +5; or if the switch is on the −10 position and the meter reads −5 the level is −15 db.

For ease in switching the oscillator and meter, the circuit shown in Fig. 34 is very convenient. This employs a 4 pole 4 position rotary switch. When the switch is on the "Calibrate" position the meter is connected directly to the oscillator. When it is on the "Send" position, the oscillator is connected to the "Send-Receive" terminals. When the switch is on the "Receive" position, the meter is connected to the "Send-Receive" terminals. On the "Loop" position the transmitter is connected to the "Send-Receive" terminals and the meter to the "Loop" terminals. On straight-a-

(Please turn to page 28)

Handy Pole Rack Device

By CARL O. MORGAN

The vise illustrated above is used to hold poles from turning sideways and slipping endways when gaining or topping and will be found particularly useful when old poles are brought into the yard that require a piece taken off of the butt to form a new ground line or in shaving off places that will form water pockets.

This device was made from one ten-pin arm cut in two, two braces and two through bolts. A third V placed about five feet from either end will be found very useful for cutting shorter lengths which can no longer be used as telephone poles. These can be sold in every small community as clothes line poles and fence posts to rural subscribers. This cutting can be done quicker with a cross cut saw.

Independents Discuss Bell Special Services

● The general committee of the United States Independent Telephone Association on special services of the Bell companies held a meeting at the Stevens Hotel, Chicago, June 16 and 17. This committee consists of:

Louis Pitcher, Dixon, Ill., chairman; J. H. Agee, Lincoln, Neb.; Samuel Tucker, Pleasanton, Kan.; W. C. Henry, Bellevue, O.; W. N. McAnge, Bristol, Tenn.; E. R. Hannibal, Everett, Wash.; A. Wardman, Whittier, Calif.; O. M. Vaughan, South Haven, Mich.; R. V. Achatz, Aurora, Ind.; W. F. Goodrich, LaCrosse, Wis.; J. P. Boylan, Rochester, N. Y.; H. E. Bradley, Harrisburg, Pa.; B. L. Fisher, Martinsville, Va.; R. A. Lumpkin, Mattoon, Ill.; J. E. Albert, Columbus, O.; J. G. Crane, Kansas City, Mo.; Gustav Hirsch, Columbus, O.; Lon Jester, Chicago, and E. G. Waters, Savannah, Ill.

All members were present except Mr. Crane and Mr. Lumpkin, the latter being represented by E. A. Purcell. In addition, H. F. McCulla of Lincoln, Nebr., and A. U. Meadows of Bristol, Tenn., participated.

The committee was formed in January of this year to consider the procedure of the Bell companies in connection with all the special services offered the public by those companies, such as teletypewriter service, short-period and long-period talking service, etc.

There had been much dissatisfaction expressed by the various members of the Association over the procedure being followed by the Bell companies in soliciting contracts for these special services, and over the compensation paid the Independent companies for their part in supplying the services once the contract is made.

● The committee held its first meeting on February 28, when it considered data supplied by the Association officers as to the charges for the services, procedures, etc., that had been filed by the Bell companies with the F. C. C. and the various state commissions. Comparisons of these filings showed differences among the Bell companies themselves. The committee at that time voted to have its opinion as to what the procedure should be put in definite form and re-submitted to the committee. This was done and further studies were made by the Association officials of the telegraph contracts: it being considered that teletypewriter service is a form of telegraph and not a form of telephone service.

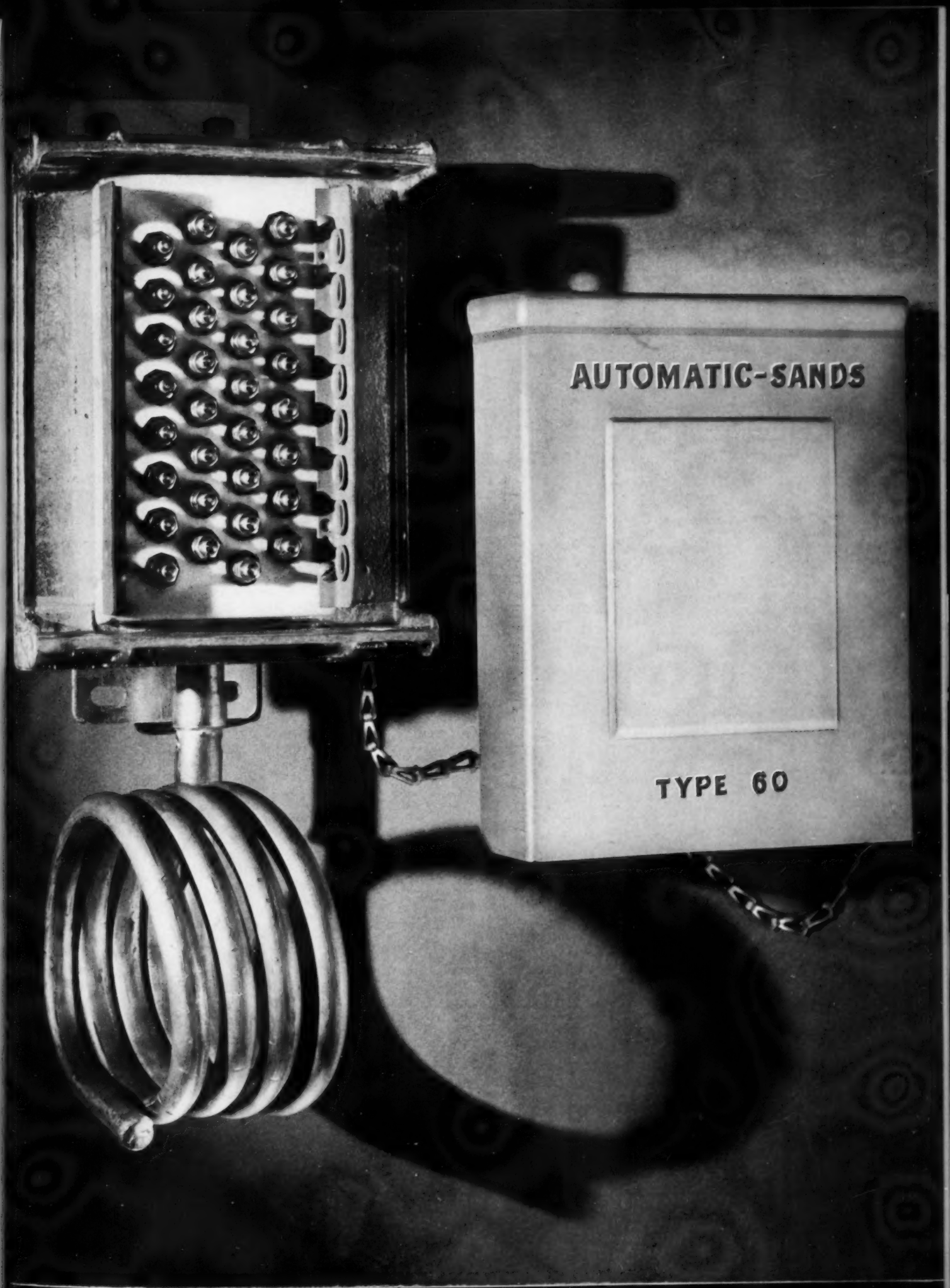
With this further data before it, the committee met to prepare a definite recommendation to the executive committee of the Association as to the position that the Association should take up negotiations with the A. T. & T. Co., and in securing the modification of the present procedure and rates of compensation to the Independent companies. At the conclusion of the two-day session, the committee submitted its recommendations, which included one for immediate action as the question of participating in these special services is one that is before practically every Independent company, or is likely to come before them due to the increased use of those services by the public and the constant soliciting of business concerns by the Bell agents to contract for these special services.

● Immediately after the conclusion of the general committee's meeting, the executive committee of the Association held a meeting at which the report of the general committee was submitted; and a decision was reached as to the procedure to be followed by the officers of the Association in presenting the recommendations of the committee to the proper Bell officials, and in explaining the committee's stand to the members of the Association. Association President F. B. McKinnon assured the members of the committe that with these definite recommendations before him, after the very careful consideration of the problem by the general committee, he would act promptly in bringing negotiations to a conclusion in endeavoring to obtain the adoption of the procedure and rates of compensation recommended by the committee.

Telephone Companies Not In Census of Business

The following letter pertaining to the Census of Business has been issued by the United States Independent Telephone Association:

"We are informed that representatives of the Bureau of the Census are asking some of our companies to fill out forms in connection with the Census of Business covering the year 1935. We have taken this matter up with officials of the Bureau at Washington, and are informed that telephone companies are not included in this Census of Business, as they are covered by a separate census. Therefore, if you are called upon by any of the enumerators to fill out the form, please notify them that you understand that telephone companies are not subject to the Census and ask them to so report to their Supervisor, who do doubt has correct instruction from Washington."



N, CENTRAL OFFICE AND OUTSIDE PLANT...

Switchboard Maintenance

(Continued from page 18)

ance of each part will be one sixth of the total resistance. For example, suppose the resistance of 30 feet of 22 B & S gauge annealed copper wire is 0.492 ohms at a temperature of 75° F., what is the resistance of 1000 feet?

Since the resistance of a conductor varies directly as its length, the resistance of 1000 feet of the wire will be as many times the resistance of 30 feet as 1000 is times 30;

$$\text{or } R = \frac{1000 \times 0.492}{30} = 14.4 \text{ ohms.}$$

(2) The resistance is inversely proportional to its cross sectional area, the temperature and the length of the conductor remaining constant, that is, the resistance decreases at the same rate the conductor cross section increases, all other quantities remaining constant. Hence, if the area of the conductor is reduced to one-fourth of its original value, the resistance will be decreased to one-fourth of its previous value. Example, a conductor 0.01 square inches in area, has a resistance of 0.063 ohms per foot. What is the resistance per foot of a conductor of the same material 0.001 square inches in area? Since the resistance of a conductor varies inversely as the area, the resistance of one having a cross section of .001 square inches will be as many times that of the one having a cross section of .01 is times .001;

$$\text{or } R = \frac{.01}{.001} \times 0.063 = 0.63 \text{ ohms.}$$

(3) The resistance of the conductor depends on the material of which it is composed. The resistance of iron, for example is more than six times as great as that of copper, for the same length and cross section.

● The resistance of a copper conductor increases as the temperature increases. The hotter a copper wire becomes, the greater is its resistance. On the other hand, the resistance of carbon and of battery electrolytes (acid solution) decreases as the temperature increases. For instance, the resistance of the carbon filament of a certain type of P. B. X. switchboard lamp when cold is about 450 ohms, but when hot (incandescent) about 225 ohms.

All metals belong to the same class of substances called conductors and of which copper is the most universally used in telephone operating practices because of its specific resistance or resistivity, as it is cimmonly called. Resistivity is the resistance between opposite ends of a standard volume of the selected material and is usually expressed in ohms per mil foot.

This law of resistivity may be expressed by the formula: $R = \frac{KL}{A}$

The physical meaning of "K" may be readily determined by making the length of "L" and the area "A" of the conductor each equal to unity (state of being 1). "K" then, is the resistance of a conductor of unit length having a cross sectional area equal to unity. There will, of course, be as many values of "K" for a given material as there are units in which to measure the length and area of the cross section of the conductor. There are, however, usually only two values of "K" in common use, and they are called the specific or mil foot resistance.

The value of "K" (one foot of copper wire 1/1000 inch in diameter) is 10.79 ohms at 75° F. For iron wire of the same size and length at the same temperature, the value of "K" is 63 ohms.

In the majority of cases, electrical conductors used in P. B. X. practices have a circular cross section and when the area of this cross section is calculated by multiplying the square of the diameter by $\pi/4$ the factor 0.7854 is obtained. The Greek letter pi (π) is used as a symbol for 3.1416, the ratio of the circumference of a circle to its diameter.

In order to avoid the frequent use of the factor 0.7854, a more convenient practical unit for measureing areas of electrical conductors in round form has been adopted and that is the circular mil. The circular mil is the area of a circle whose diameter is one mil or 0.001 inch.

Since two wires are usually required for transmitting a current of electricity the formula as given in the following is made simple by counting the distance only one way in feet, and doubling the value of "K" which for copper is conveniently taken as 22. As an example, say that a telephone station is installed 600 feet from the P. B. X. switchboard. The E. M. F. of the P. B. X. battery is 16 volts and 0.040 amperes is required at the telephone transmitter. Allowing for a loss of 5 per cent in battery voltage during transmission of the current, what size conductor is required? By formula

$$CM = LK \times \frac{I}{VL}$$

or

$$600 \times 22 \times \frac{.040}{8} = 660 \text{ circular mils.}$$

The nearest size conductor to 660 circular mils as given in a B & S wire gauge table is 642.4 circular mils and is size No. 22. Therefore, in the above case is would require 600 loop feet of 22-gauge twisted pair insulated wire to supply the telephone with the necessary transmitter current. It is customary to select the size wire in circular mils nearest that calculated except in cases where the size given in the wire table and the calculated size are the same.

(TO BE CONTINUED)

Modern Practices In Cable Splicing

(Continued from page 16)

alarm and immediate action could be taken to avoid cable failures. Telephone service has become so important in practically every community that even short cable failures that impair service on several telephones cannot be tolerated by a progressive telephone company. Furthermore, this special gas equipment and its maintenance will not be nearly as expensive as the occasional cable failure.

But until that fair day arrives when all exchange cable systems are maintained under constant gas pressure, we will rest on our laurels, with at least one dream realized and will wager that the splicing of our cables will not increase our gray hairs for we will always keep on hand a good supply of the best wiping solder available, our trusty Dillon Temperometer and our ever reliable nitrogen testing outfit—what more should a mere telephone man desire.

A. T. & T. Leads in Public Stockholders

A tabulation of the largest corporations in this country, rated according to the number of common stockholders, was recently placed before the Federal Communications Commission as an exhibit in the telephone industry investigation.

It showed:

American Telephone and Telegraph as the largest corporation in the world in number of shareholders, with almost 700,000.

Cities service, more than 500,000.

General Motors, 310,000.

Pennsylvania Railroad, 220,000.

United States Steel and General Electric, 190,000 each.

Consilidated Gas, 100,000.

Western Light & Telephone

Western Light and Telephone Co. reported net income of $312,885 for the twelve months ended April 30. Revenues totaled $2,179,308, expenses $1,565,889, and depreciation $300,533.

Editorial « « «

Plowing Back Profits

Now and then we run across editorials in other publications which, in our opinion, warrant reprinting in TELEPHONE ENGINEER. In its May issue, *Iron Age* published as an editorial a statement by Herman H. Lind, general manager, National Tool Builders' Association, discussing the corporation surplus tax legislation recently enacted.

While the reprinting of this editorial may be a little late we believe it brilliantly presents an important point of view which should be considered by future congresses when legislation jeopardizing industry and business is proposed for enactment. Mr. Lind's statement follows:

"The prudent farmer knows that he must conserve the condition of his soil, if he is to prosper. He cannot expect to take continually from his fields without giving back to them. That is why you see him plowing back the sweet clover, the soy beans and the rank rye.

"He realizes the necessity of returning to the earth a portion of the profits that he secures from it in the form of those chemical elements that are necessary to avoid depletion and to insure continual abundance of production.

"The improvident farmer, on the contrary, gives no thought to the future, reaps the entire yield and plows back nothing. His thoughtless policy and practice are responsible for our abandoned farms and for the millions that Uncle Sam must now spend to counteract the effects of soil depletion.

"There is food for thought in this for our legislators who are now considering the corporation surplus tax proposal. Industrial fields, like farm acres, must be kept fertile or they will become sterile and impoverished. They need a plowing back of a portion of the dollar crops that come from them. Research, modernization, replacement, development must continue, if our industrial soil is to be kept from becoming barren and depleted.

"Our industrial fertilizers are not sweet clover and rye, but dollar profits. These have been plowed back by provident manufacturers in the past to conserve industrial fertility. Abandoned plants, like abandoned farms, are the result of an improvident policy which neglects to do this.

"If unwise legislation should deprive us of the possibility of thus plowing profits back into our industrial fields, the time may come when the soil of production and employment will be depleted. If this should happen, Uncle Sam will have to spend billions to restore our producing power, just as he is spending hundreds of millions to restore our barren acres."

Telephone Transmission Theory and Practice

(Continued from page 21)

way measurements, the procedure is as follows. A transmission set consisting of an oscillator, meter and switch is connected to each end of the circuit. For measurement in the east-west direction, the operator at the east terminal first throws the control switch to the "Calibrate" position. He then adjusts the output of the oscillator to a given level, say zero, on the meter. The operator at the west end of the line throws the control switch to "Receive" and reads the level. For example, if the meter reading is –5, the transmission loss through the circuit is 5 db. If the transmission equivalent is so great that no deflection on the meter is observed, the output at the sending end may be raised until a reading is obtained at the receiving end. For example, if the sending level, necessary to give scale deflection, at the receiving end was +15 db and receiving level was –20 db the circuit loss would be 35 db.

On measurements in the reverse direction the procedure would be the same except that the west station would first throw the control switch of his transmission set to "Calibrate" and adjusts his output to a given level, and then throw it to the "Send" position. At the east end of the line the operator throws the control switch to the Receive position and reads the meter.

● When testing equipment and lines which can be looped together so that all measurements can be made at one point, the "Loop" circuit of the transmission set may be used. For example, if we are to measure the loss through a repeating coil, one side would be connected to the "Send-Receive" terminals and the other to the "Loop" terminals. The control switch is first thrown to "Calibrate" and the output adjusted to a given level say zero. The switch is then thrown to the "Loop" position and the meter reading noted. The loss is the difference between the two readings. For example if the meter read zero on the "Calibrate" position and –1.5 on the "Loop" position the loss would be 1.5 db.

This same circuit arrangement may be used in measuring the gain of telephone repeaters. Assume we wish to measure the gain through the east-west side of the repeater; connect the east side of the repeater to the "Send-Receive" terminal and the west side of the repeater to the "Loop" terminal. Throw the control switch to the "Loop" position and adjust the output of the oscillator until the meter reads a given level, zero for example. Then throw the switch to the calibrate position and read the meter. The difference represents the gain through the repeater. If the meter reading on the "Loop" position is zero and on the "Calbrate" position –10 the gain through the repeater would be 10 db.

Some care must be used in level measurements so as to not overload any portion of the equipment. For example, most telephone repeaters will pass a level of about +5 db without overloading. Appreciable errors might result therefore, if the oscillator energy is adjusted so high that the level at the output of repeater exceeds this amount. Ordinarily on repeated circuits the output level from the transmission set may be carried as high as zero without the possibility of trouble. However where terminal repeaters are used, care must be exercised to see that the level is sufficiently low so that overloading will not occur.

(TO BE CONTINUED)

"Tapping In" On Washington

(Continued from page 14)

Lone Star state has no state regulatory body. It is thought likely that the Federal Commission may rely on the decisions of the Oklahoma and Kansas commissions for its findings on the proposed acquistion of exchanges in those states. The Southwestern Associated through its vice-president, R. B. Fairly, informed the FCC in the acquisition application that the purchase would mean improved service and maintenance for the communities served by the present Western Light and Telephone exchanges because of greater coordination of operations.

● The first acquisition case, and the only previous one, which has been before the FCC, was the subject of an oral argument before the Telephone Division, June 29, when two attorneys for the Illinois Bell Telephone Co. protested the denial by an examiner of the application of the Crown Point (Ind.) Telephone Co. to purchase the Northwestern Indiana Telephone Co. for $507,514. The examiner had held the purchase price too high in the light of 1933-34 revenues of the Northwestern Indiana Company and based on an inspection of that company's property for a few days by FCC investigation engineers. He suggested that it should be reduced to $363,000 or at least below $400,000. The Illinois Bell counsel cited that the $507,514 price had been approved by the Indiana Public Service Commission which had the regulation of 90 per cent of the Northwestern Indiana Company's operations. However, the FCC was asked to make a finding which would permit the culminating of the purchase without further delay and "red tape" of pressing a new application through the Indiana Commission and the Federal Commission.

• ● •

Black Stopped . . .

Chief Justice Wheat of the District of Columbia Supreme Court June 25 made permanent the injunction against the Western Union Telegraph Co. banning it from turning over telegrams of the Silas Strawn law firm of Chicago to the Senate Lobby Committee, headed by Senator Black of Alabama. The injunction referred specifically to messages of the first ten months of 1935. This case marked the first defeat of the Alabama senator in his seizure by blanket power of telegrams of anti-administration foes as well as alleged lobbies and really ended this phase of his investigation. The telegram seizures brought a storm of censure upon the Alabama senator and his committee, while at the same time the suit revealed the participation of the FCC in inspecting telegrams for alleged irregularities and the FCC purported aid to the Black committee.

• ● •

Friday the 13th . . .

Friday the 13th in November has been chosen as the date for the discussion of telephone regulation, including the topic of percentage rates of depreciation and the jurisdiction of the Federal Communications Commission under Section 2-b-2 of the Communication Act over intrastate carriers, at the annual convention of the National Association of Railroad and Utilities Commissioners at Atlantic City Nov. 10-13. It is expected that Telephone Division Chairman Paul A. Walker of the FCC will be the principal speaker on telephone regulation.

Replaces Exchange

A new telephone exchange has replaced the one which burned in Rutledge, Tenn., last month.

Dr. L. C. Bryan has acquired the service and is building a trunk line from Jefferson City.

Since the fire there have been only two telephones in Rutledge, at a motor company and a drug store. They are on the line from Morristown.

GIVE YOUR SUBSCRIBERS BETTER SERVICE

IN all parts of the country, telephone companies are making their service more immune to weather—by replacing open wire with Western Electric cable.

Whatever type you need, Western Electric makes it—or *will* make it to your specifications. Standard types include lead covered—impregnated jute protected—tape armored—wire armored submarine—and a complete line of textile insulated and cellulose acetate lacquered terminating cables.

All Western Electric cable is made to Bell System standards of quality—you can depend on it! For full information, write Graybar Electric, Graybar Building, New York. Or telephone Graybar's nearest branch.

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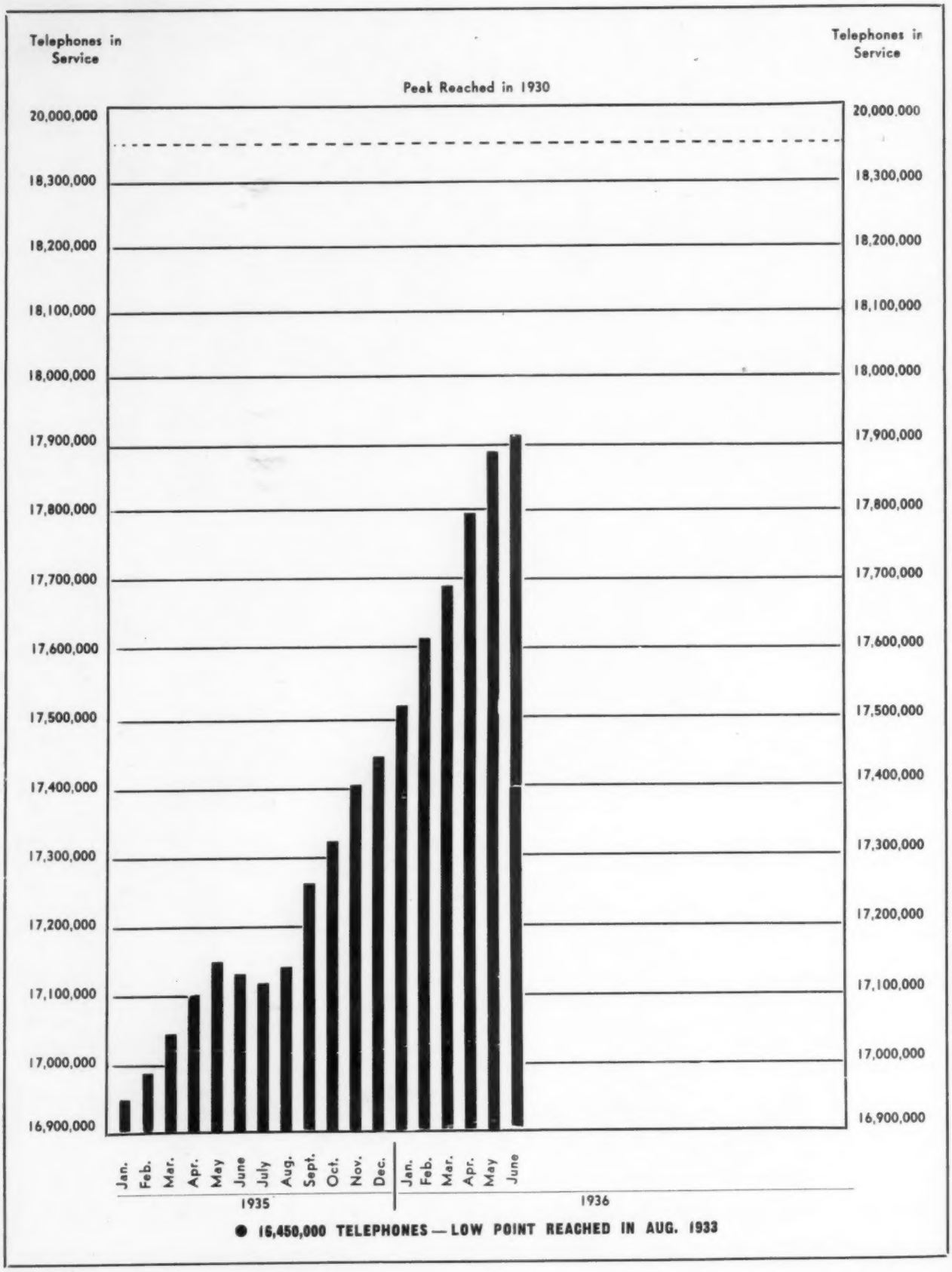
Monthly Telephone Station Barometer



NATIONAL CONVENTION OCTOBER 13 TO 16

The annual convention of the United States Independent Telephone Association will be held at the Hotel Stevens, Chicago, October 13 to 16 inclusive. The arrangement for exhibits, meeting rooms, etc., will be the same as for the last three years. The manufacturers' exhibits and headquarters will be located on the 25th floor, and the meetings will be held in the Tower Room on the 28th floor.

Ordered to Pay Part of Investigation Cost

The Up-State Telephone Co. of New York has been ordered to pay an assessment levied against it by the State Public Service Commission for $2,862.54, to pay part of the expenses of a rate investigation.

In 1934 the state setup a revolving fund to meet the expenses of rate investigations. Under this law the commission assessed the company for $2,862.54 for a search of records and affairs from Aug. 27 to Dec. 31, 1934.

Another assessment against the company of $3,919.55 for investigations between Jan. 1, 1935 and June 30, 1935, was paid. The company contended the first assessment exceeded the PSC's authority under the law, which stipulated the sum in one year of only ½ of one per cent of the company's gross operating revenue for the previous year may be assessed.

Presiding Justice Hill's opinion affirmed the commission's order.

Thirty-five years ago, Bell System telephones could be connected with only 36 per cent of the telephones in the world. Today, about 93 per cent of the world's 35,000,000 telephones are within reach of any Bell or Bell-connecting telephone.

CONVENTION SCHEDULE

Michigan Independent Telephone Association, Olds Hotel, Lansing, July 29 and 30.

The Illinois Telephone Association, Pere Marquette Hotel, Peoria, September 17 and 18.

The United States Independent Telephone Association, Hotel Stevens, Chicago, October 13 to 16.

"2-in-1" Telephone

No. 90

WILL SATISFY YOUR SUBSCRIBERS

LEICH 2 in 1 — Telephone builds up customer satisfaction and as a result increases the demand for service. LEICH self contained handset telephones are universally approved by the public. This combination telephone saves on stock investment. Why not invest in this unusual equipment.

LEICH 2 in 1 — The LEICH handset transmitter is without a peer—the cone shaped diaphragm —submerged electrode—moisture proof materials — combine to make a transmitter which is standing up in service. The receiver is designed to faithfully reproduce the complete band of voice frequencies.

LEICH 2 in 1 — The new LEICH No. 90 handset telephone with booster anti side tone transmission and having a two tone ringer in the base is your answer in providing a telephone which will give modern service.

LEICH 2 in 1 — The No. 62 handset telephone may be used with any conventional bell box. Add a sub-base with ringer and you have the modern No. 90 handset telephone. One handset meets ALL your requirements.

LEICH ELECTRIC COMPANY
GENOA, ILL.

TELEPHONE APPARATUS BACKED BY 28 YEARS' SERVICE

North Dakota Has Interesting Convention

● The 30th annual convention of the North Dakota Telephone Association was held May 26 and 27 in Fargo.

F. W. Vail, Milnor, was elected president of the association; G. B. Brown, Enderlin, was chosen vice-president; and A. T. Nicklawsky, Hillsboro, was reelected secretary-treasurer.

R. J. Perrin, Rhame, was elected director to fill the unexpired term of E. M. Tompkins, Holliday, who has retired from the telephone business. The following directors were re-elected for three-year-terms: Mr. Nicklawsky, B. M. Burreson, Pekin, and R. W. Williams, Minot.

The convention was opened by President M. M. Borman of Abercrombie and Hugh C. Corrigan of the Fargo City Commission gave the address of welcome, which was responded to by H. A. Brown of Cooperstown.

President Borman, in his address, stated that the telephone business in the state was on the upgrade and that good crops and good prices will give the business greater impetus.

Secretary-Treasurer A. T. Nicklawsky reported the association in good financial standing with a substantial cash balance.

"Rural Electrification" was the subject of an address by R. R. Herrmann, Northern States Power Co., Minneapolis.

George A. Soule, Fargo attorney, addressed the convention on "The Social Security Act". C. W. McDonnell, North Dakota Board of Railroad Commissioners, Fargo outlined the duties of the commission and its relationship with public utilities.

The second day's meeting was opened with an address on taxes by Horace C. Young, attorney, North Dakota Taxpayers Association. The next speaker was R. R. Smith, director of the sales tax commissioner's office, who spoke on the operation and need of the sales tax.

P. M. Ferguson, general manager, Citizens Telephone Co., Mankato, Minn., represented the United States Independent Telephone Association of which he is a director. Mr. Ferguson discussed the work carried on by the national association.

Results of several weeks' conference with the Rural Electrification Administration relative to the effect its program will have on telephone companies, were discussed by J. C. Crowley, Jr., secretary, Minnesota Telephone Association.

● Conditions in his state were reported by Thomas Phalen, secretary South Dakota Telephone Association. Jay Houghtaling of the Kellogg Switchboard & Supply Co. spoke for the manufacturers exhibiting at the convention.

President Borman introduced Acting General Manager W. J. Brazell of the Northwestern Bell Telephone Co., who discussed the progress and development of the telephone industry.

The concluding address on the program was given by M. O. Ryan, secretary, Greater North Dakota Association and The State Planning Board, respectively, who discussed "State Planning".

Gives 5-Point Television Program to FCC

● A basic five-point program to plan for the successful development of television in the public interest was recommended to the Federal Communications Commission by James M. Skinner, chairman of the Radio Manufacturers Association Special Committee on Television, at the engineering conference called by the Commission in Washington, June 16, on allocation of ultra high-frequency waves.

Television will not be ready for the public for several years to come, but provision must be made now for its growth, said Mr. Skinner. Sound radio and television will not be competitors. Sound radio is used, not only as a primary source of entertainment and education, but also as a background while reading, resting, working or playing bridge. Looking at television requires concentration. However, said Mr. Skinner, the addition of daily television programs at certain hours should be a very important addition to the home life of the American people.

● The United States is not lagging behind in the perfection of television, Mr. Skinner explained, but owing to the larger area of the country, and the lower density of the population the problems of providing a service are greater here than in Europe. He urged the Commission to adopt the following television policies:

1. Establishment of a single set of television standards for the United States so that all receivers shall be capable of receiving the signals of all transmitters.

2. Development of pictures free from distortion and blur, approaching ultimately the distinctness and clarity obtainable in home movies.

3. Provision for services giving as near nationwide coverage as possible, so that the benefits of television may be available to all sections of the country.

4. Provision for a choice of programs, that is simultaneous broadcasting of more than one television program in as many localities as possible, to avoid monopoly and to provide variety of educational and entertainment features.

5. Lowest possible receiver cost and easiest possible tuning, to stimulate domestic installations of television receivers, both of which are best achieved by allocating for television as nearly a continuous band in the air waves as possible.

● Experimental work in television has reached a "promising stage," Mr. Skinner stated, citing the experimental high definition television broadcasts which have been on the air for some time from the Philco Radio & Television Laboratories in Philadelphia and from RCA-Victor at Camden.

Engineers of the radio industry have already held many meetings under the auspices of the Radio Manufacturers Association and have arrived at practically complete agreement on basic television standards, it was pointed out. Nine basic items have been covered, laying the groundwork for future television developments, all pointing to the same goal—a single television system for the United States, with every receiver capable of receiving every broadcast reaching its locality.

Warns Against Monopoly In Television

To prevent unjust levies of tribute on the public in the television field, Samuel E. Darby, Jr., of Darby & Darby, counsel in patent and anti-trust causes, raised the issue of monopoly at the hearing on television before the Federal Communications Commission. Mr. Darby appeared on behalf of eleven independent radio manufacturers who have produced about three quarters of the radio sets in the United States.

Mr. Darby warned that Radio Corporation of America (R. C. A.) is endeavoring to extend its radio patent pool monopoly to the television field. He warned the Commission against accepting in television the monopoly principle which costs the American people $5,000,000 yearly and has cost them in tribute to R. C. A. about $50,000,000 in the last nine years.

The independent radio manufacturers who include the makers of Philco, American Bosch, Zenith, Crosley, Sears Roebuck, Montgomery Ward, Emerson, Stromberg-Carlson, Motorola, Stewart Warner and Sparton, are working jointly in the public interest and their own interest to prevent their and the public's exploitation by R. C. A. in the new television field.

Mr. Darby urged the Commission to consider the record of those who apply for television licenses. He urged that television be not allowed to fall into the same state as radio manufacture had fallen into—in which the public pays tribute to the patent pool monopoly of R. C. A.

New York Telephone Co. Accepts Rate Cut Order

BULLETIN

The New York Telephone company announced today its acceptance of the order issued by the public service commission on June 26, reducing certain of its rates and charges throughout the state in August to save subscribers about $4,200,000 a year. James L. Kilpatrick, president of the company, said the commission order was of doubtful legality, but the company had decided not to make a court fight.

The decision announced June 26 by the New York Public Service Commission ordering reductions in the rates for several classes of telephone services has been made before the New York Telephone Co. has had an opportunity to present to the commission the whole of its proof upon the several factors involved in the determination of fair and reasonable rates. At the public hearing held on June 18 when the commission indicated its intention to make such an order counsel for the telephone company advised the commission that in his opinion no valid or lawful order could be made in the present state of the record before it. However, the company has not yet seen copies of the commission's opinion and order and until it has had time carefully to examine and consider them it will be unable to decide upon the action it properly should take.

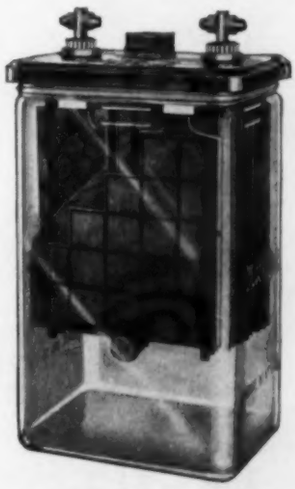
At a hearing last month in the New York Telephone Co. rate proceedings before the state Public Service Commission, Commissioner Neal Brewster announced that the Commission was considering the termination of the proceedings which have continued for two years and which he estimated would require an additional two years to conclude if testimony on all aspects of the case were to be introduced.

Commissioner Brewster, in his announcement, indicated that if the case were closed at this time the Commission was contemplating the issuance of an order making certain reductions in rates. The company's position with respect to the announcement was that it would do everything in its power to expedite the proceedings, but that the Commission had no valid or legal right to close the case and issue an order reducing the company's present revenues before proof on all factors involved in fixing rates had been submitted and considered.

"Service Enemy #1"

When lightning interrupts the electric service for your exchange, you can depend upon Exide Batteries to carry you through the emergency.

While electric companies can minimize the effects of lightning—they cannot prevent it from striking their lines. Frequently, telephone service interruptions result from lightning cutting off the normal supply of power to telephone exchange equipment. It is during such emergencies that Exide Batteries can be depended upon to carry the full load of your exchange. The operation of storage batteries is not interfered with by fluctuations or interruptions in the A.C. circuits. During such emergencies they will help keep the majority of your lines in service. There is an Exide Battery for every telephone job.



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The World's Largest Manufacturers of Storage Batteries for Every Purpose
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TO ALL YOUR RINGING TROUBLES !

THIS MASTER RINGING MACHINE HAS

- No moving parts
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It Is Economical and Dependable

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Especially adaptable for use in communities having fluctuating power characteristics because "SUBCYCLE" Automatically compensates for variations in frequency and voltage.

Operates on 110 Volts A. C.

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Optimism Prevails at Pennsylvania Convention

● At one of the best conventions held during the past several years, telephone men and women of Pennsylvania displayed unusual optimism and confidence in their business as reports of increases in stations and toll business came from all sections of the state during the annual convention of the Pennsylvania Telephone and Traffic Association, June 11, 12 and 13 at Harrisburg.

The convention was opened with an address of welcome by Harrisburg's Mayor John A. F. Hall, which was responded to by J. F. Stockwell, Keystone Telephone Co., Philadelphia.

In his address President H. E. Bradley pointed out that the untiring work and courageous efforts of telephone people during the recent floods, which covered practically the entire state, created in the minds of the public new confidence and trust in the telephone industry and its people.

● Perhaps the keynote of President Bradley's address was the plea to telephone companies of the state to use their association for expert advice and special services which it is prepared to give. He traced the work of the association during its life and declared that it was in a position to give service which would otherwise be very expensive to the telephone companies. This is a point often stressed by TELEPHONE ENGINEER, which has continually urged greater membership in and greater use of the facilities of state telephone associations by the members.

Dr. Leonard P. Fox, research bureau, Pennsylvania State Chamber of Commerce, followed President Bradley on the program with an address on "State Fiscal Trends and Problems."

One of the features of the convention was interesting discussion on "Flood Un-Control," which was participated in by the following:

C. E. Jones, chief engineer, Pennsylvania Telephone Corp., Erie, covering flooded area at Johnstown; G. E. Twigg, plant engineer, United Telephone Co., of Pennsylvania, Harrisburg, covering flooded area is south-central Pennsylvania; and William W. Shoop, auditor, Vandergrift Telephone Co., Vandergrift, covering flooded area around Vandergrift, on the Conemaugh River.

E. M. Clark, general plant supervisor, western area, Bell Telephone Co. of Pennsylvania, covered the flooded area at Pittsburgh, and J. A. Fitzpatrick, chief engineer of the central area of the Bell Telephone Co., of Pennsylvania, covered the flooded area in the north-central and north-eastern Pennsylvania (Williamsport, Wilkes-Barre, and Sunbury).

● F. B. MacKinnon, president, United States Independent Telephone Association spoke on "The Telephone Problems of 1936." These he discussed from the national standpoint. He was followed by J. W. Wopat, consulting engineer of Fort Wayne, Ind., who discussed "Grounded Power Lines—Their Effect on Rural Telephone Circuits."

"Magic Bottles" was the subject of a feature presented by Professors Stavely and Crossley of the Pennsylvania State College, demonstrating the use of vacuum tubes and photo-electric cells in modern electronics.

At the convening session A. S. Ellenberger, telephone and telegraph engineer, Pennsylvinia Public Service Commission, spoke informally on certain studies of telephone properties made by his office.

Officers re-elected by the directors in April, follow: President, Mr. Bradley; vice-presidents, J. H. Wright, Meadville, and J. F. Stockwell, Philadelphia; secretary-treasurer, M. E. Cunningham, Harrisburg, Pa. The directors of the association are as follows:

Eastern District—Mr. Stockwell; S. H. Mounce, Carbon Telephone Co., Lansford; H. A. Oberdorf, Columbia Telephone Co., Columbia; G. B. Rudy, Jr., York Telephone & Telegraph Co., York; Ralph Van Trine, United Telephone Co. of Pennsylvania, Harrisburg.

Western District—A. O. Black, Peoples Telephone Corp., Butler; K. B. Schotte, Kittanning Telephone Co., Kittanning; Mr. Wright; W. W. Shoop, Vandergrift Telephone Co., Vandergrift telephone Co., Vandergrift; A. W. Thompson, New Wilmington Telephone Co., New Wilmington.

300 Attend Missouri Convention

● In the neighborhood of 300 telephone men and women of Missouri assembled in Kansas City May 27 and 28 to attend the annual convention of the Missouri Telephone Association. Vice-President A. M. Benedict of Richards, in the obsence of President Houck McHenry of Jefferson City, presided at the convention.

Because of failing health President McHenry has been unable to attend the past two conventions. Mr. Benedict expressed a tribute to Mr. McHenry, who was one of the founders of the Missouri association and who has given unlimited time and effort in the affairs of the association.

Mr. Benedict in his address before the meeting discussed the telephone situation in rural communities and di-

rected his remarks to plans to acquaint the public with the telephone business. He suggested a nationwide advertising program might be carried on to give the public facts regarding the telephone, which he said "is the most universally used of all the utilities . . . yet it is perhaps the least understood of all of them."

● Following Mr. Benedict's address M. R. Gray, commercial superintendent, United Telephone Co., spoke on "Eight Hundred Telephones in Two Weeks" and explained the methods used by his company in gaining these additional stations.

Dr. S. T. Neill, Clinton, one of the state's pioneer telephone men was called upon for a few words and M. L. Golladay of Holden then asked the convention to stand in silence as a tribute to several members of the association who had passed away, including Ben Scruggs, Colonel Hudson, Mr. Plummer and G. W. Schweer.

J. W. Wopat, Fort Wayne consulting engineer, addressed the convention on "Rural Electrification" which he has presented before several state conventions this year.

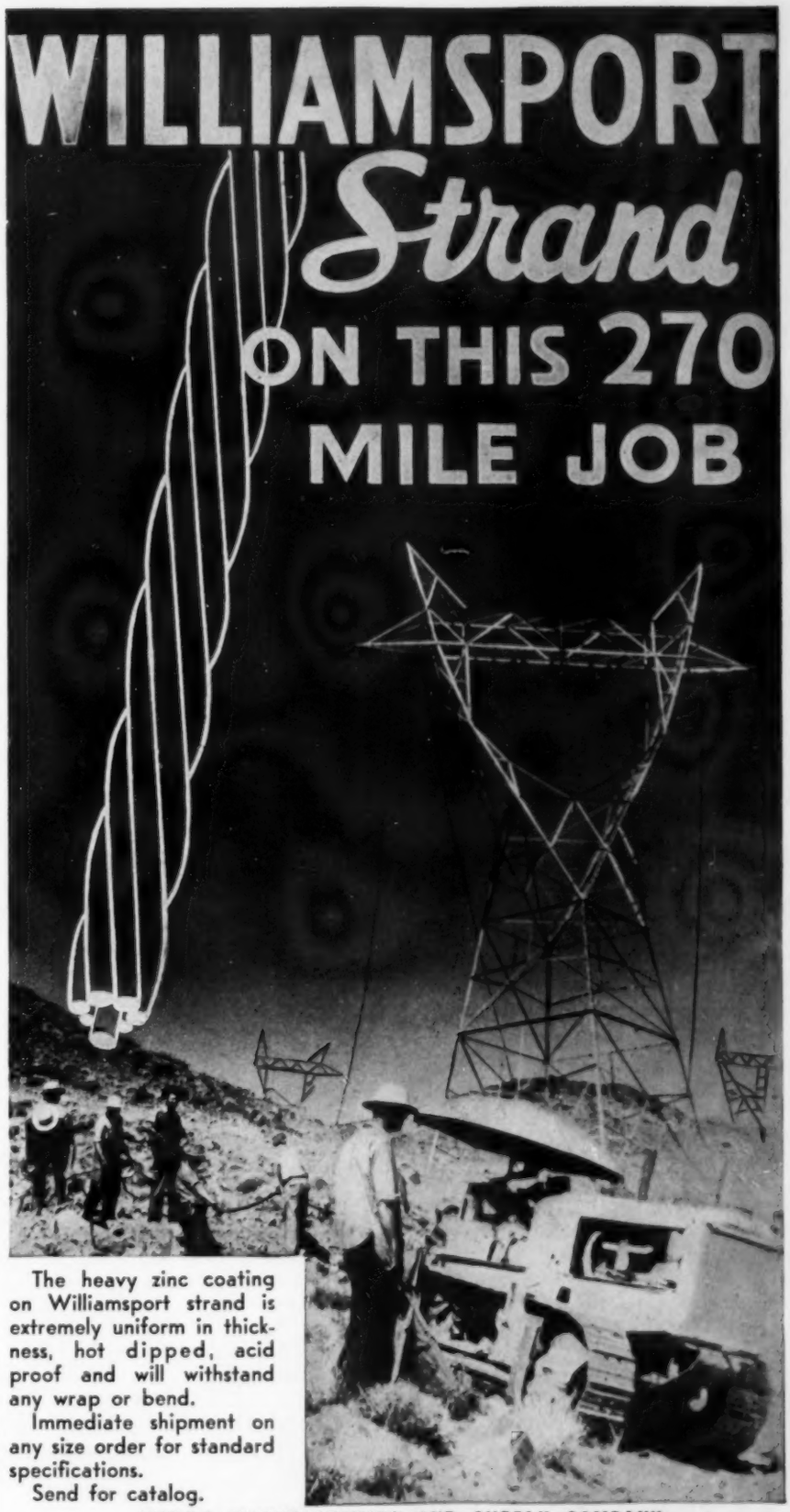
F. B. MacKinnon, president, United States Independent Telephone Association, then addressed the convention on "The National Situation", in which he discussed the problems confronting the industry brought forth by federal regulatory activities.

● The second day's meeting was in the form of a joint operating and plant maintenance conference. Among those taking part in the conference were C. A. Quigg, district plant chief, Southwestern Bell Telephone Co.; H. B. Whatley, toll traffic supervisior, Southwestern Bell company; Herb Couch, secretary, Kansas Telephone Association and M. R. Thompson, Toledo, Ia.

The operators and maintenance men then separated into two groups. Mr. Quigg was in charge of the plant conference and Miss Barbara Schulz and Miss Ida Potter were in charge of the operators' session.

The officers re-elected for the ensuing year are: President, Mr. McHenry; secretary-treasurer, R. W. Hedrick; Jefferson City; first vice-president, Mr. Benedict; second vice-president, W. R. Journey, Higginsville; third vice-president, T. R. Schweer, Rolla; and fourth vice-president, Elmer Weakley, Plattsburg.

The following were elected to the executive committee for three year terms: S. T. Neill, Clinton; E. F. Carter, Columbia; and C. W. Boutin, Cape Girardeau.



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More Hours of Service

. . . that's what every telephone engineer seeks . . . *more hours of service* . . . which means fewer replacements, lower service costs! And that's exactly what Ray-O-Vac telephone batteries offer!

For 3 decades Ray-O-Vac batteries have met and exceeded specifications and requirements on every recognized telephone and light intermittent test, and surpass all government standards. For lower service costs, specify Ray-O-Vac!

RAY-O-VAC COMPANY
Formerly FRENCH BATTERY COMPANY
MAIN OFFICES AND PLANT
MADISON, WISCONSIN
Additional Factories at
Clinton, Massachusetts and Lancaster, Ohio

Citizens Public Service Changes Name

The name of Citizens Public Service Co. of Missouri has been changed by formal action of its stockholders to Missouri Union Telephone Co. There has been no change in the management or personnel and none of importance in its assets and liabilities, save as respects its no par value common capital stock, which with consent of the Public Service Commission of Missouri, has been divided into 7,000 shares of no par value, instead of 1,000 shares of no par value previously outstanding.

With the distribution of the aforesaid shares among the old holding company bondholders, the last connection between Citizens Public Service Co. of Missouri, now Missouri Union Telephone Co., and any other corporation disappears. This company is strictly and totally independent and is substantially owned and controlled by its officers, directors and employees. Directors recently elected for the ensuing year are as follows:

Thos. S. McPheeters, George W. Simpkins, Lois B. Ellis, secretary; Oliver C. Agne, vice-president and Hansell Hillyer, president.

A. R. Bone Resigns As Secretary of Illinois Bell

Directors of the Illinois Bell Telephone Co. accepted the resignation of A. R. Bone, secretary and treasurer, effective June 30, it was announced. Arthur Perrow, general auditor, succeeds him. Perrow is succeeded by A. D. Grote, for many years general accountant.

Bone has been in the telephone business actively since 1887. He has been with the Illinois Bell Telephone Co. and its predecessor, the Chicago Telephone Co., since 1898 as solicitor, exchange manager, special agent, commercial superintendent, general commercial manager and secretary and treasurer.

In addition to his telephone duties he has been active in civic affairs. It is reported that he has served on more Chicago Association of Commerce committees and for a longer continuous period than any other individual.

Mexico Orders Companies To Unify Services

The Mexican communications department announced June 25 it had instructed the Mexican and Ericsson Telephone companies to unify their facilities in Mexico.

A financial merger of the two competing companies is not demanded, the announcement made clear—merely the interconnection of their lines and the intercommunication of their instruments. The companies were given 15 days to present plans for unification.

The Mexican Telephone Co. is a subsidiary of American Telephone and Telegraph, the Ericsson of International Telephone and Telegraph.

Harry A. Ball Dies

Harry A. Ball, life-long resident of Valparaiso, Ind., and general manager of the Northwestern Indiana Telephone Co., passed away last month. He had been associated with the telephone company since 1900 in various capacities.

Install New Equipment

Approximately $10,000 is being spent by the Badger State Telephone Co. at Marshfield, Wis., in the installation of new underground and overhead cable in their local operating area.

$845 for Phone Call

A social radio telephone call, lasting 1 hour and 43 minutes, between Melbourne, Australia, and England, cost the caller $845.

C. W. Motter

Desires Position as Advertising and Publicity Director or Commercial and Sales Director.

Background of utility experience in both telephone and light and power fields. College Trained - Officers Training School, Machine Guns. Three years business experience office and field (hardware and automobile). Practical, sound, forceful speaker, works and wears well with associates and people. Able writer. Has a large acquaintance in Middle West. Can furnish the highest type of references.

Experience In Utility Field

1922-1926 — United Telephone Company, Abilene. Directory and special sales and public relations work; rate case surveys; consolidated manager in towns where company purchased properties. Later advertising and sales promotion director; editor of The Voice; and advertising and sales promotion manager of United Light and Power Company.

1929-1936 — Publicity, advertising and sales promotion manager, Lincoln (Neb.) Telephone and Telegraph Company. Duties included direct charge of public relations activities, radio programs, sign and display advertising, speakers' bureau; editor, Lincoln Telephone News.

C. W. MOTTER
840 Stuart Bldg.
Lincoln, Nebraska

COOK
XB Terminal

Cook Protected Pole Cable Terminal, XB, is a superfine quality product.

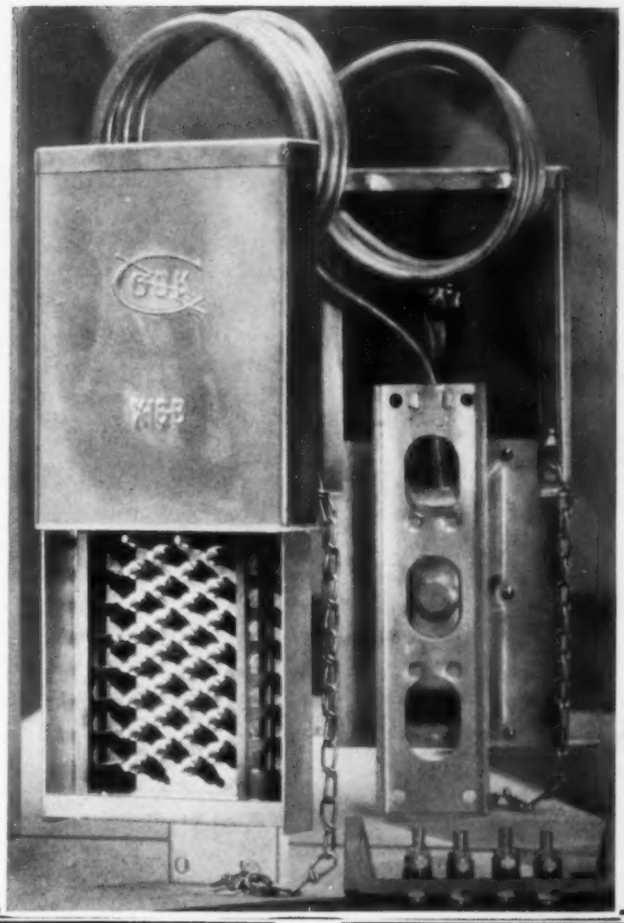
Every detail has been worked out to secure ease of installation, perfect termination of cable, very high-grade insulation, accessability for drops, tightness against weather and dust, lightness, strength, and durability.

Soldering of cable sheath to the box is a patented Cook feature and makes a perfect joint — one seal perfectly made in place of two which are necessary with a nipple.

A cable clamp holds the cable securely to the terminal bracket and prevents danger of strain at the connection with box.

Box and bracket are formed of heavy steel and like the heavy chain, are hot galvanized. The hood is made of heavy zinc and covers the terminal tightly.

For Gas Tight Terminals State Maximum Pressure



Drops are taken through adjustable openings in lower end of terminals, which are designed to limit openings to exact amount required.

The XB moulded bakelite face plate has had many years of successful service. It offers high insulation with no danger from surface condensation. The fanning strips are a part of the moulded face plate.

Studs, nuts, and washers are of Everdur, a copper, silicon alloy, which shows the highest resistance to weather corrosion of any metal used for this purpose.

In every detail the XB has been designed and made THE PERFECT TERMINAL.

Cook Electric Co.

Chicago, Illinois

Where "MORE" means "LESS"

VACUUM GRIP PROFESSIONAL LINEMAN PLIERS

Designed by skilled tool makers, with every feature for facilitating the work of the lineman.

Lineman's Favorite

58-R - 8½" - $3.25
57-R - 7" - 2.50
56-R - 6" - 2.00

Company or lineman's name etched FREE on handle of each pair.

YOU pay only a *little more* for Vacuum Grip Lineman Pliers than for other makes — but you actually pay *much less* when you figure that one pair outlasts three and four pairs of ordinary pliers.

Is there any economy, we ask you, in saving a few cents at the beginning, only to lose dollars in the long run!

Every year our records show a big increase in the sales volume of these superpliers. *Somewhere* there are purchasing agents who have weighed first-cost differentials, and wisely ignoring the negligible extra cost of Vacuum Grip Pliers, have found that it represented a far from negligible saving.

Special prices on lots of one-half dozen or more.

OUR 30-DAY TRIAL OFFER

enables you to prove our claims to your own satisfaction, by means of running tests—at no risk of loss to yourself. Write us for particulars.

FORGED STEEL PRODUCTS CO.
NEWPORT, PA.

Vacuum Grip Pliers

BUILT UP TO A STANDARD NOT DOWN TO A PRICE

OVER A MILLION IN USE

For July and August

15% DISCOUNT

ON CHANCE CAPSTAN PULLEY BLOCKS AND LINEMEN'S SOCKET WRENCHES

For a limited time only we are offering to the trade a special discount of 15% on all Chance Capstan Pulley Blocks and Lineman's Socket Wrenches. Don't fail to take advantage of this unusual offer.

A·B·CHANCE CO.
Utilities Division
CENTRALIA MISSOURI

BETTER PLIERS

● Klein Pliers are made for the man who needs or appreciates a remarkably fine tool.

From the careful inspection of the alloy tool steel made to the most exacting specifications—

Through the old craftsman methods of individual manufacturing and individual heat treating—

To the final steps of rigid inspection and testing, each pair of pliers that carries the Klein trademark represents the maximum in plier quality.

Klein methods viewed in the light of modern mass production are necessarily more costly.

On the other hand, for a man who demands a plier of Klein quality there is no way to produce it except the Klein way.

Mathias KLEIN & Sons
3200 BELMONT AVENUE, CHICAGO, ILL.

National Association Reports On Rural Electrification

The United States Independent Telephone Association released the following letter to state association executives on July 2 on the subject of the Rural Electrification Administration, which is of vital interest to all Independent telephone companies:

"We are keeping in as close touch as possible with the Rural Electrification Administration. When we have news of the organization of an electric cooperative, notice of an allotment of funds for construction, or notice of a loan made for rural electrification, we pass the news on to you. WHAT DO YOU DO ABOUT IT?

"The REA has stated repeatedly that it expects cooperatives to whom it makes loans to observe the laws of the state in which it operates, to observe the rulings of the Commission, etc.; so that in these respects the cooperative is on the same footing as a private utility.

"The liabilities of the electric companies to the telephone companies are different in the different state jurisdictions; and in every case where the electric company is responsible to the telephone company for any expense which is caused it by the electric company—moving of lines, transposing, or re-transposing, or for any expense to eliminate inductive interference, the telephone company must be constantly on the alert to see that its rights are protected.

"In general, the following is the procedure followed by an electric cooperative company; a temporary organization of the farmers interested is formed, contacts the REA at Washington, and learns what the REA requirements are. At an early stage, the Rural Electrification Administration may make an allotment of funds for the construction of the proposed lines. This allotment of funds does not mean that the cooperative will ever be carried through to the completion of its organization, or that it will ever receive a loan. It is a very tentative matter. At about this stage the cooperative secures a project engineer who makes maps of the proposed lines and estimates their costs. These detailed estimates and maps are sent to the REA at Washington, who has its engineers go out on the ground and check the estimates, etc.; and upon his report and his approval of the estimates the loans are made. The REA loans 100% of the cost of the line and takes a mortgage upon it.

"It is therefore extremely important that if the electric company has any money liability to the telephone company that these estimates cover that liability, and if so covered and if in a reasonable amount it will be approved by the REA. If the estimates do not cover the amount of the liability of the electric company to the telephone company, you can readily see that after the cooperative has spent its money that it is likely to be impossible for the telephone company to make collection. Having spent the entire amount of its loan and having mortgaged the line for 100% of its value, the telephone company will be left 'holding the sack.'

"We repeat again that telephone companies who have a right to collect anything from the electric companies must be constantly alert, and must see to it that the amounts they are entitled to receive are covered in the electric companies' estimates on which their loans are based; and this means that the Association Secretaries and Executives must keep their members informed, and should stand ready to lend their members any necessary assistance.

"The Minnesota Telephone Association has been very active in protecting the rights of its members. We have sent you two pamphlets published by the Railroad and Warehouse Commission of the State of Minnesota. The material in these pamphlets was approved and recommended by a committe representing the telephone and power interests.

"The Rural Electrification Administration has been eminently fair in treating with us. At our suggestion it is advising the engineers of each cooperative electric project that there is likely to be a telephone problem and that it should receive consideration. The REA requires that the blue prints submitted to showing the location of the proposed electric lines shall show the location of the communication circuits in the vicinity. The REA advises the engineers whom it sends out to check the estimates that there is likely to be a telephone problem. This is evidenced to the engineers by the blue prints which have already been filed.

"As previously stated, if the electric company has a liability to the telephone company the REA will approve, as part of the cost of the line, reasonable amounts to meet this liability."

The following statement appeared in the June 19 issue of *The Agricultural Outlook*:

Rapid extension of electrical service to farmers will be a feature of the next decade under the $410,000,000 federally financed Norris Act. Loans of $50,000,000 for the first year and $40,000,000 in each of the succeeding nine years through the Rural Electrification Administration are authorized.

Loans may be made for building lines and for wiring, appliances and plumbing on the premises of customers. They bear 2.75% interest and are amortized

(Please turn to page 42)

The "PIGMY" HOIST WITH A GIANT'S POWER

A real Telephone Company Service Tool . . . the

PUL-LIFT

The PUL-LIFT is small and light enough to easily be carried about by one man, yet its power and durability are amazing—and it is a real glutton for work. It both pulls and lifts—operates either in horizontal or vertical position.

This remarkable device is appropriately called "the tool of 1000 uses." It is made in 4 sizes—¾, 1½, 3 and 6 tons capacities.

IT PULLS—IT LIFTS

PUL-LIFT—Sold by Yale distributors in every industrial center—or write direct to us for details.

THE YALE & TOWNE MANUFACTURING CO.
PHILADELPHIA DIVISION — PHILADELPHIA, PA.

YALE

OK for ANY SPLICE ANYWHERE

NATIONAL DOUBLE TUBE SPLICING SLEEVES

ASSURE TIGHT UNIFORM JOINTS

You'll make efficient, uniform line joints, easily and quickly when you do the splicing job with National Double Tube Sleeves.

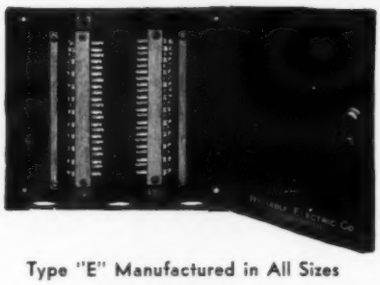
These splicing sleeves have been delivering satisfactory service to telephone and telegraph companies for a long period of years.

Every joint made with a "National" has maximum strength — it is tight as a weld.

"Nationals" are above all practical, meeting fully the toughest splicing requirements. Write today for prices and samples.

THE NATIONAL TELEPHONE SUPPLY COMPANY
5100 SUPERIOR AVE. CLEVELAND, OHIO

STEEL BUILDING BOXES



Type "E" Manufactured in All Sizes

NEATLY DESIGNED.

NUMEROUS KNOCKOUTS AT TOP AND BOTTOM.

SCREW BINDING POSTS FOR DISTRIBUTING WIRES.

SOLDERING TERMINALS FOR CABLE WIRES.

Reliable Electric Company
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BUILT TO "TAKE IT"

THE YEAR 'ROUND

IN HOT WEATHER OR ICY COLD

OWENS-ILLINOIS

HEMINGRAY

Pin-Type Glass **INSULATORS** *are OK for long life*

● There's no proving ground for insulators like actual service right up on the poles where nature can hammer away at them winter and summer with cold, heat, rain, frost, wind and snow. That's where Hemingray Insulators have proved they are unaffected by seasonal or sudden temperature changes. They are homogeneous in character with only one coefficient of expansion. Write us about your requirements. Owens-Illinois Glass Company, Structural Materials Division, Muncie, Ind.

OWENS-ILLINOIS Glass PRODUCTS

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Operator Chairs

No. 446-DS

A true posture chair designed to increase efficiency, mental alertness, reduce fatigue, improve the health and comfort of the operator.

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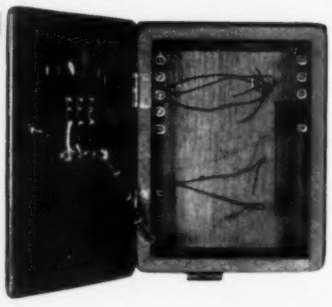

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Write Today for Special Prices

Mention quantities, styles and details, and we'll promptly show you the lowest prices you've had yet.

Suttle Equipment Co.

LAWRENCEVILLE, ILLINOIS

Increased Rates Due To High Taxes, Says Editor

The *Ohio Telephone News*, official publication of the Ohio Independent Telephone Association, reprinted an editorial from a Ohio newspaper in its July issue, which we believe deserves to be presented to the telephone industry at large as it pertains to taxes paid by an Ohio telephone company. Therefore, through the courtesy of the *Ohio News* and the newspaper we reprint the editorial:

Under the heading "Soak the Rich," the editor of the *Wauseon Republican* says:

"President Franklin D. Roosevelt, his New Dealers and Brain Trusters, are shouting 'soak the rich in taxes' to produce the money for them to spend—millions of dollars of it wasted as projects on every hand prove.

"The people of Wauseon and community now have a striking example of how this policy of 'soaking the rich' works.

"The Northwestern Ohio Telephone company of this city filed an application on September 25, 1935, with the Public Utilities Commission asking for authority to increase the telephone service to its patrons.

"The State Public Utilities Commission directed its engineers to make an appraisal of the value of the telephone property of the Northwestern Ohio Telephone company and to investigate the company's operating cost, that the Commission may have this information in deciding whether or not to allow the application for the increased rates, or what rates should be allowed by it. The engineers have now completed their work and have filed their report with the commission.

"In the engineers' report among other items of expense allowed in operating the Northwestern Ohio Telephone company, are the items of taxes. The report also states that the company can charge such a rate for its telephone service as to meet all its necessary expenses and that the taxes are made a part of the necessary expense. Thus it is the people who use the telephones that actually pay the taxes with which the company is soaked. That means the more they soak the company for taxes the more the patrons of the company must pay for their telephone service.

"The engineers' report show that for the year 1935 the Northwestern Ohio Telephone company paid taxes as follows:

Personal taxes	$1,033.02
Excise taxes	597.51
Public Utility taxes	27.62
Federal Unemployment tax	144.00
Capital Stock tax	35.00
Federal Income tax	689.91
Total	$2,527.06

"This total tax of $2,527.06 paid by the Northwestern Ohio Telephone company is charged back to the patrons of the company and they pay it. This is a clear illustration of how President Roosevelt's policy of 'soaking the rich' is nothing more nor less than indirectly soaking the poor.

"Of the total $2,527.06 taxes paid by the telephone company only $1,033.02 stays in Fulton county. The rest of it either goes to Columbus or Washington, and so far as the people of Fulton county are concerned, are hidden taxes, they pay them and don't know it and the money goes out of their community for others to spend."

Commercial telephone service between Great Britain and Ceylon has been inaugurated. The service is by radio telephone to British India and thence by land lines and submarine cable to Ceylon.

McCaig New Stromberg Chicago Manager

H. T. McCaig, Sr., has been appointed manager of the Chicago Office of the Stromberg-Carlson Telephone Manufacturing Co. according to announcement just issued by the main office of the company. Mr. McCaig assumes the position left vacant by the resignation of A. M. Haubrich.

H. T. McCaig, Sr.

Mr. McCaig, who has been with Stromberg-Carlson since 1911, has had a wide and varied experience in the telephone and allied fields, ideally fitting him for his new duties.

In 1902 he entered the employ of the Nebraska Telephone Co. at Omaha, occupying successively positions in their local plant, general plant and engineering departments. During this time he

assisted in the work of cutting over the Omaha plant from magneto to common battery operation.

Following the cutover he was appointed wire chief of the Harney (Omaha) branch exchange. Later was transferred to the south exchange as wire chief. From here he went to the engineering department in the general offices of the company where he had both plant and traffic engineering assignments.

Leaving the employ of the Nebraska Telephone Co. in 1908, which in the meantime had become a part of the Northwestern Bell Telephone Co. he spent the next three years with the Monarch Typewriter Co., gaining valuable sales experience traveling the Nebraska territory and managing the company's Lincoln branch office.

In February 1911 he joined the sales force of the Stromberg-Carlson company and was assigned the Nebraska territory. A year and a half later he was transferred to Des Moines, Ia., from which point he covered both Iowa and Nebraska.

With the absorption of the Garford Manufacturing Co. in 1916 realignments of territory cut his field down to only a portion of Iowa, but this was soon changed to an assignment of the whole state.

Early in 1921, Carl W. Schaefer, who died recently, then manager of the Chicago Stromberg-Carlson office, requested that Mr. McCaig be named his assistant, the post he has held since that date.

A. J. Penote, Trencher Co. President, Dies

Augustus J. Penote, 55, president and founder of The Cleveland Trencher Co. and The A. J. Penote Co., died suddenly May 9 at his home in Cleveland, O., of an acute heart attack.

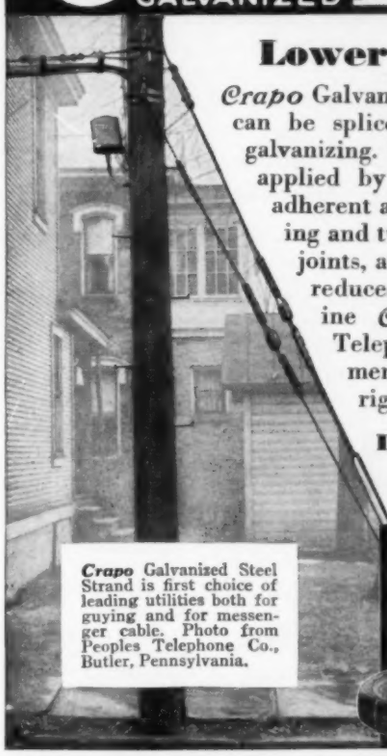
Mr. Penote was born in Buffalo, N. Y., but had resided in Cleveland for the past 38 years.

He was nationally known throughout the public utility field as a contractor, manufacturer and inventor. Among his many inventions was the full-crawler-type trenching machine, of compact design for city work, which he constructed originally for his own use; subsequently founding The Cleveland Trencher Co. for its manufacture.

As a contractor, Mr. Penote installed underground cable and conduit systems, gas lines, etc., in many cities throughout the Middle West.

Universally respected and loved by business associates and employees, Mr. Penote was proud of the part his work and inventions have played in the expansion of utility service.

Crapo
GALVANIZED PRODUCTS



Crapo Galvanized Steel Strand is first choice of leading utilities both for guying and for messenger cable. Photo from Peoples Telephone Co., Butler, Pennsylvania.

Lower Maintenance Costs

Crapo Galvanized Telephone Wire and Steel Strand can be spliced and served without injury to the galvanizing. The heavy, uniform, *pure zinc* coating, applied by the *Crapo* Patented Process, is so adherent and so ductile that it defies sharp bending and twisting. This insures corrosion-resisting joints, adds to the life of the wire and actually reduces maintenance costs .... Specify genuine *Crapo* Galvanized Steel Strand and Telephone Wire for all new and replacement work! They more than meet the most rigid specifications. ....

Indiana Steel & Wire Company
Muncie, - Indiana

Telephone Wire • • Steel Strand

The **DILLON TEMPEROMETERS**

Register Correct Temperatures of —

- **Paraffin**
- **Compounds**
- **Wiping Solder**
- **Impregnation Wax**
- **Cable Damming Waxes**

THE DELUXE TEMPEROMETER (with dial) registers correct temperatures of paraffin, compounds, wiping solder, impregnation wax and cable damming waxes. Laboratory tests prove that to get the most dependable results these materials MUST be heated to specific temperatures. The DeLuxe not only tells you what these temperatures are, but is the only instrument that actually registers them for you.

THE JUNIOR TEMPEROMETER registers the correct temperature of wiping solder ONLY. Tests made with standard wiping solder composed of 40 per cent tin and 60 per cent lead show that telephone cable joints do not become porous or crystalized when wiping solder is heated to 760° F. when ladling is started over the joints. Under gas pressure tests, joints ladled with underheated and overheated solder proved to be defective.

Prices, Deluxe Model, $6.00; Junior Model, $4.00. FOB Chicago.

SOLD BY LEADING TELEPHONE DISTRIBUTORS

DILLON MANUFACTURING CO.
63 EAST LAKE STREET CHICAGO, ILLINOIS

National Association Reports On Rural Electrification

(Continued from page 38)

over a 20-year period.

Since lines cost $300 to $400 per customer and wiring and appliances costs are about equal to the line cost, these funds would electrify 600,000 to 700,000 farms. Allowing for extensions by private utilities and for purchases of wiring and appliances by farmers for cash, expectation that a million farms may be electrified in the next 10 years appears reasonable.

Since it began to function in 1935, REA has made allotments of funds to 79 projects providing for over 12,000 miles of lines averaging about 3.8 customers per mile. Nearly half of these projects and more than half of the lineage were in Midwest states. Details by states are as follow:

	Projects Approved	Miles of Line
Indiana	4	798
Illinois	6	839
Wisconsin	5	1,085
Minnesota	4	1,206
Iowa	9	808
North Dakota	1	115
South Dakota	none	none
Nebraska	7	2,435
8 Midwest States	36	7,286
40 Other States	43	4,841
United States	79	12,127

Extent of the market for electrical facilities is indicated by the sponsors of a project in Richland County, Wisconsin, who report that of 752 customers who have definitely agreed to take power from the new lines.

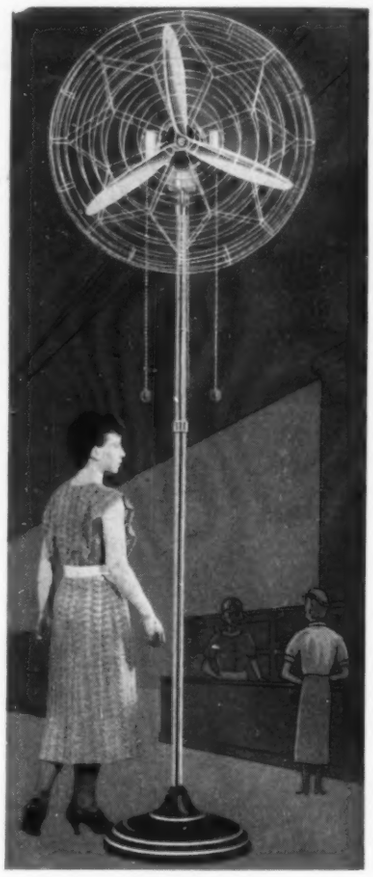
"Air Comfort" Electric Fan For Telephone Exchanges

Managers of telephone exchanges will be extremely interested in one of the newer developments in providing "air comfort" for switchboard operators, commercial and engineering employees and patrons visiting telephone offices, particularly during the hot weather months.

Realizing the serious ventilating problem confronting telephone managers during excessive heat periods, TELEPHONE ENGINEER, during the past two years, has investigated different types of electric fans in order to find one that would help managers solve this exchange problem.

One manufacturer, the Gaylord Mfg. Co. of Chicago, is marketing a type of fan which it claims is a new development, ideal for telephone exchanges.

This company states that through scientific study it has found that at least two things are required to produce a noticeable measure of air comfort in hot



New "Fresh'nd-Aire" Fan

weather. First, it is necessary to circulate the room air at all levels gently but thoroughly and yet without draft. Second, it is necessary to deodorize, purify and sterilize the air.

Blowing hot blasts of air around a room does not produce air comfort because the organic matter surrounding the tiny air bubbles holds odors and other matter which makes the air feel stuffy, hot and "smelly", the company states. It is necessary to clean the air of these odors and of this organic matter. When this is done the air feels fresh and bearable regardless of the temperature.

The Gaylord company states that its "Fresh'nd Aire" fan combines air movement and air cleaning in such a way that complete and thorough circulation can be secured with the exact amount of air noise permissible in switchboard rooms.

Further information may be obtained by writing American Automatic Electric Sales Co., Kellogg Switchboard & Supply Co., Stromberg-Carlson Telephone Mfg. Co. (Chicago Office), or the Gaylord Mfg. Co.

Materials and Manufacture

Conductors are selected to meet rigid specifications based on telephone requirements and every shipment is tested to see that those specifications are met. Insulating materials are all of premium quality and constantly checked for adaptability to telephone needs, and must meet our specificaions, which result in long service for Whitney Blake Telephone Wires. Throughout the entire manufacturing process we use the latest and best methods and machinery, supplementing this with a series of tests and inspections in every department, plus a final series of tests before we apply the Whitney Blake lead seal of quality.

Telephone Wire

RUBBER COVERED
COPPERWELD - BRONZE - COPPER
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HOTEL
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WITH PRIVATE BATH *from* $2.50 WITHOUT BATH *from* $1.50

GEO. H. MINK *Manager*

Here's a hotel value for you. A large room right at the edge of the Loop, with every comfort and luxury at a rate surprisingly low

Phillips Cords
are definitely better

In the new PHILLIPS telephone cord, the outer covering is composed of a material never before used for the purpose. This wiry fabric produces a tougher, longer-wearing braid than anything heretofore experienced—one that adds literally months and years of wear to the useful life of the cord!

Besides this, still further improvement has been effected by laying the conductors flat instead of twisting them together in the usual way—a construction which virtually eliminates kinking. Insulation resistance also has been materially increased by means of a specially-developed process of impregnation.

Here at last in the PHILLIPS cord, is a better cord for every telephone use—one that you are urged to try at your earliest convenience. To order, merely specify number of conductors, length of trim desired. Prices gladly quoted upon request.

PHILLIPS PRODUCTS INCLUDE: Bare and Insulated Copper Wires—Rubber Insulated Wires—Enameled Wires—Magnet Wire—Power Cables—Switchboard Cables—Paper Insulated Cables—Flexible Cords—Electrolytic Copper Rods, Shapes, etc.

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(See our space in next month's issue)

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Advanced Design
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For Pulling
GUY WIRES
MESSENGERS
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CABLES, etc.

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By JOHN MILLS

Here is "a book designed for readers who would like a clear non-technical introduction to the principles of electrical communication. . . . Sixteen short chapters, written in a semi-technical manner and free from mathematics and diagrams, present readable and interesting explanations, of dial switching, telephone repeaters, multi-channel transmission systems and trans-oceanic communication." The engineering achievements in the allied fields of sound pictures, broadcasting, television and stereophonic reproduction are also explained.

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He should supply the necessary reporting Forms without charge, and be ready to assist you with your various annual Government or State reports. Twenty-five years of this kind of experience is offered to you.

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22 years continuous contact with telephone organizations.

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COLUMBUS, OHIO

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L. S. BRACH Mfg. Corp., Newark, N. J.

NEON ARRESTER UNIT
Replaces Carbon Mica
Avoid Grounds or Leaks

SOLDERALL
Pure Metal Solder and Flux Combined
In Collapsible Tube

TEST-O-LITE
Pocket Voltage Tester—100 to 500 Volts
Indicates AC or DC and Polarity

WRITE FOR BRACH CATALOGUE

Test Sets

LITTELFUSES

- INSTRUMENT LITTELFUSES, for meters, 1/200 amp. up.
- HI-VOLT. LITTELFUSES for transmitters, etc., 1,000 5,000, & 10,000 volt ranges, 1/16 amp. up.
- NEON VOLTAGE FUSES & Indicators (TATTELITES), 100, 250, 500, 1,000 & 2,000 volt ratings.
- AIRCRAFT FUSES, AUTO FUSES, RADIO FUSES, FUSE MOUNTINGS, etc. Get new Cat. 6.

Littelfuse Labs., 4238 Lincoln Ave., Chicago

Steel Insulated Buildings For Unattended Exchanges

Proved advantages of frameless steel insulated buildings for unattended dial exchanges, evident after a two-year installation test, prompted the Peoples Telephone Corp., Butler, Pa., to order the construction of two additional units.

The buildings are designed and constructed by The Insulated Steel Construction Co., Middletown, Ohio.

Early in 1934, because of several unhappy experiences, officials of the telephone company became interested in modern steel construction. After careful investigation, they accepted a design submitted by the Middletown company. It was for a sub-station building at North Washington, Pa. This station measures 10 by 16 feet, with a 10-foot ceiling height. Later a second station, measuring 11 by 15 feet, with a 10-foot ceiling height, inside dimensions, was erected at Parker's Landing, Pa.

The Insulated Steel Construction Co. recently received two more orders from the same company for sub-stations to be erected at Eau Claire and Sunbury, Pa.

Wall sections of frameless steel are made of 20-gage Armco steel sheets, manufactured by The American Rolling Mill Co., Middletown, O. They are formed into cells measuring 3 x 10 inches. Sections are protected with suitable rust-resisting compounds, thoroughly insulated with vermiculite. Walls and roof are fabricated in the shop in large sections, so constructed as to form a continuous flat surface on both sides as well as above and below.

Exteriors of the buildings are covered with porcelain enameled sheets, attached to the walls by aluminum clip-strip. This encircles the building in horizontal rows, which are placed the proper distance apart to receive the porcelain enameled sheets and corner details.

In addition to being fireproof, the buildings are considered to be ideal structures because of the elimination of radio interference and dusting.

A simple frame on which equipment is hung allows ready access from both front and rear. Because of the type of building the usual steel case can be eliminated.

Power lines and telephone cables are carried in special built conduits within the walls which are attached to the hollow framework and battery rack.

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Carney

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Plain or Butt Treated
B. J. CARNEY & CO.
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Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

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Write or telephone for proposition
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Call L.D.16—Telephone Bldg., Dayton, O.

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Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
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Telephone Engineering — Construction Supervision — Appraisals — Financial — Rate Investigations
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CONSULTING
ACCOUNTANTS AND ENGINEERS
Specializing in a Professional Service to Telephone Utilities Covering the Field of Accounting and Engineering
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SYRACUSE, NEW YORK

The Clearing House

For the convenience of readers of Telephone Engineer

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TRANSMITTERS

Absolutely finest workmanship guaranteed

Baked, black, velvet finish, New granular carbon. Workmanship, adjustments and tests made with the latest and most improved apparatus. 50c each less backs. One year money back guarantee.

Full information on request

*** THIS MONTH'S SPECIAL ***

FOR SALE

Rebuilt Automatic P.A.X. with charging unit—24 Telephones, handset and wall phone complete with dials $485.00

Bakelite mouth pieces for W.E. transmitters — per C $5.00

Bakelite mouth pieces for Automatic Electric transmitters — per C $5.50

NEW OAK CABINETS for signal sets and wall phones well made and nicely finished, with or without terminals and cables. Detailed description with dimensions and prices on request.

50 W. E. Common Battery Steel Hotel Sets, concealed gongs, each $8.50

Telephone Repair Shop

Operated by Dan'l H. McNulty

1760 LUNT AVE., CHICAGO, ILLINOIS

RECONSTRUCTED EQUIPMENT

Western Elec. No. 122AF 500 ohm relays @	$1.75
Western Elec. No. 118AC 10 ohm relays @	1.25
Western Elec. No. 12B Repeating coils @	2.50
Western Elec. No. 8K Double wound Retard coils @	1.25
Monarch desk set complete with Monarch 3-bar 1000 or 1600 ohm ringer inside connection signal set @	7.85
Stromberg Carlson desk set complete with 4-bar 1000 or 1600 ohm ringer inside connection signal set @	9.00
Automatic Elec. desk set complete with 4-bar 1000 or 1600 ohm ringer inside connection signal set @	9.50
Kellogg New Grabaphone hand set complete with W. E. No. 240 3-bar 1000 or 1600 ohm ringer signal set @	11.00
Kellogg No. 729 S. A. Straight line C. B. Oak finish wood hotel set with Booster coil @	6.75
Kellogg No. 631 C. B. Steel hotel set with straight line ringer & Booster coil @	6.85
Western Elec. No. 21 W. 1 M. F. Cond. 40c ea. No. 21d or E 2-M F. Cond. @	.35
Western Elec. No. 20 C. B. Ind. Coils @	.35
Kellogg No. 53 2 M. F. Condensers @	.35
Leich Elec. Local Battery Transmitter complete with back @	1.00
Kellogg No. 41 Receiver with New shell & Cord @	1.25
Western Elec. No. 143 Rec. or Stromberg Carlson No. 27A with New shell & cord @	1.15

REBUILT ELECTRIC EQUIPMENT CO. Not Inc.

1940 West 21st St., Pilsen Sta. Chicago, Ill.

To Show Subscribers How To Cut Toll Costs

Plans of the Northern Ohio Telephone Co. to enlarge personnel and scope of its public relations and toll promotion department were revealed with annonuncement that Nap T. Videan joined the Northern Ohio corps on July 1 in the capacity of assistant to the commercial superintendent. Mr. Videan resigned recently as an assistant cashier of the Union Bank and Savings Co., of Bellevue, after several years' identification with the financial institution.

In his new position Mr. Videan maintains headquarters in Bellevue, but will devote his attention to the entire Northern Ohio system incident to expansion of the public relations service, especially with regard to study and solution of problems of business subscribers and extending co-operation to such clients in enabling an increased use of toll for their various business transactions, in many instances at reduced toll costs.

General Gains In June

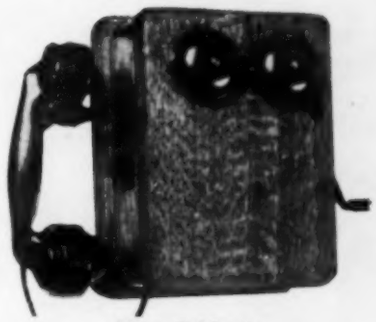
General Telephone Corp. reports for its subsidiaries a gain of company-owned stations of 596 for the month of June, 1936, or 19/100 per cent, compared with a gain of 151 stations, or 5/100 per cent for the month of June, 1935. The gain for the first six months of 1936 totals 10,555 stations, or 3.38 per cent, compared with a gain of 6,575 stations, or 2.19 per cent for the first six months of 1935. The subsidiaries now have in operation a total of 322,873 company owned stations.

The company reported for its subsidiaries a gain of company-owned stations of 3,054 for the month of May, 1936, or .98%, compared to a gain of 2,474 stations, or .82%, for the month of May, 1935. The gain for the first five months of 1936 totals 9,959 stations, or 3.19%, compared with a gain of 6,424 stations, or 2.14% for the first five months of 1935.

About 40 per cent of the shares of the American Telephone and Telegraph Company are held by women; 34 per cent by men; 4 per cent in joint accounts; 19 per cent by trustees, insurance companies, corporations, private firms, etc.; and 3 per cent are in the names of brokers.

Telephone Equipment
(Continued)

MAGNETO HAND SET TELEPHONES



New Cabinets
Reconditioned Equipment
New Leich Hand Set

3 Bar	**$13.50**
4 Bar	**14.00**
5 Bar	**14.25**

ALBERTSON ELECTRIC COMPANY
Telephone Department
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POSITION WANTED

Position wanted by telephone engineer. Eleven years with Bell System. Wide experience in the manufacture, operation and maintenance of telephone equipment. Will go any place. College education. Age 38. Married. Write D. R. D., care TELEPHONE ENGINEER.

Use

Telephone Engineer

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NEW STYLE STEWART CABLE TESTERS
With balanced coil. Locates shorts, crosses, grounds and wet spots; also tone circuit.

$49.00 Sent on trial.

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Ottawa, Ill.

MAGNETO HAND SET TELEPHONE

New cabinet with reconditioned Kellogg, S. C. Co. or Leich equipment.

New Leich Hand Set
3 bar $13.85 — 4 bar $14.25
5 bar $14.50

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W. L. Runzel, President, brings to this organization 47 years' experience in the manufacture of this type of telephone equipment.

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